Proceedings of the
American Association of Textile Chemists and Colorists

Copyright, 1956, American Association of Textile Chemists and Colorists

JULY 16, 1956

National Officers of the Association

President ..... RAYMOND W JACOBY, Ciba Co, Inc, 627 Greenwich St, New York 14, N Y
Vice President (Central Atlantic Region) . FREDERICK V TRAUT, Globe Dye Works Co, 4500 Worth St, Philadelphia 24, Pa
Vice President (Western Region) . JOSEPH H JONES, Phoenix Dye Works, 1963 Southport Ave, Chicago 14, Ill
Vice President (New England Region) . . . ERNEST R KASWELL, Fabric Research Laboratories, Inc, 1000 Providence Highway, Dedham, Mass
Vice President (Southern Region) ..... Walter M Scott, U S Dept of Agriculture, Washington 25, D C
Secretary..HAROLD C CHAPIN, Lowell Technological Institute, Lowell, Mass
Assistant Secretary ..... RICHARD R FREY, Lowell Technological Institute, Lowell, Mass
Treasurer ..... ALBERT E SAMPSON, National Aniline Division, Allied Chemical & Dye Corp, 150 Causeway St, Boston 14, Mass
Treasurer Emeritus ..... WILLIAM R MOORHOUSE, P O Box 352, South Yarmouth, Mass
Founder ..... LOUIS A OLNEY (Deceased)
Chairman of the Executive Committee on Research .... CHARLES W DORN, Consultant, Suite 1300, 369 Lexington Ave, New York 17, N Y
Director of Research. HAROLD W STIEGLER, Lowell Technological Institute, Lowell, Mass

Standing Committees of the Council

Technical Committee on Research ..... C A SYLVESTER, *Chairman*
Publicity ..... JAMES A DOYLE, *Chairman*
Conventions ..... GEORGE O LINBERG, *Chairman*
Appropriations ..... ALBERT E SAMPSON, *Chairman*
Constitution and Bylaws ..... HAROLD C CHAPIN, *Chairman*
Membership and Local Sections ... JOSEPH H JONES, *Chairman*
Corporate Membership ..... ALBERT E JOHNSON, *Chairman*
Publications ..... WALTER M SCOTT, *Chairman*
Technical Program ..... WALTER M SCOTT, *Chairman*
Technical Supplies ..... HAROLD C CHAPIN, *Chairman*

Councilors

Representing Sections

NEW ENGLAND REGION

Northern New England: JOHN P PLOUBIDES, FRANK J RIZZO, ROBERT D ROBINSON
Rhode Island: FRANCIS H CASEY, ERNEST I CHORNYEI, EDWARD H GAMBLE, RAYMOND B TAYLORSON
Western New England: RAYMOND J CAREY, RUDOLPH C GEERING

CENTRAL ATLANTIC REGION

Hudson Mohawk: IRWIN J SMITH
New York: ROBERT C ALLISON, MATTHEW J BABEY, WILLIAM F BROMMELSIEK, PERCY J FYNN, JOHN H HENNESSEY, PAUL J LUCK, HARRY MOORE
Niagara Frontier: BERNARD K EASTON
Philadelphia: ARTHUR W ETCHELLS, HARRY L MORGAN, RICHARD A SHIMP, CLARENCE A SEIBERT, JACKSON A WOODRUFF

SOUTHERN REGION

Piedmont: A HENRY GAEDE, HARLEY Y JENNINGS, HERMAN J JORDAN, JR, M M McCANN, HENRY A RUTHERFORD
South Central: JOSEPH D MOSHEIM
Southeastern: S JACK DAVIS, ROBERT B HALLOWELL
Washington: LAWRENCE L HEFFNER

WESTERN REGION

Mid-West: ERIC W CAMP, L B MacFARLAND, J GORDON STOTT
Pacific Northwest: HUBERT A DESMARAIS
Pacific Southwest: SIDNEY SPRINGER

Past Presidents

ELVIN H KILLHEFFER, P J WOOD, WILLIAM H CADY, ALBAN EAVENSON, CARL Z DRAVES, THOMAS R SMITH, WILLIAM D APPEL, HENRY F HERRMANN, C NORRIS RABOLD, J ROBERT BONNAR

Student Chapters

ALABAMA POLYTECHNIC INSTITUTE, BRADFORD DURFEE TECHNICAL INSTITUTE, CLEMSON COLLEGE, FAIRLEIGH DICKINSON COLLEGE, GEORGIA INSTITUTE OF TECHNOLOGY, LOWELL TECHNOLOGICAL INSTITUTE, NEW BEDFORD INSTITUTE OF TEXTILES AND TECHNOLOGY, NORTH CAROLINA STATE COLLEGE, PHILADELPHIA TEXTILE INSTITUTE, RHODE ISLAND SCHOOL OF DESIGN, UTICA TECHNICAL INSTITUTE

Local Section Officers

New England Region

NORTHERN NEW ENGLAND

Chairman ..... JOHN M GOULD, Barre Wool Combing Co, Ltd, South Barre, Mass
Secretary ..... AZEL W MACK, Dexter Chemical Corp, 581 Boylston St, Boston 16, Mass
Vice Chairman—E B BELL *Treasurer*—W W PENNOCK

RHODE ISLAND

Chairman ..... REMUS F CAROSELLI, Owens-Corning Fiberglas Corp, Ashton, R I
Secretary ..... CHARLES F STOKES, Carbic-Moss Corp, 87 Weybosset St, Providence, R I
Vice Chairman—T LARSON *Treasurer*—J W TIMPERLEY

WESTERN NEW ENGLAND

Chairman ..... THOMAS J GILLICK, JR, American Felt Co, Glenville, Conn
Secretary ..... ANDREW W GOODWIN, Princeton Knitting Mills, Watertown, Conn
Vice Chairman—J E HIRN, SR, *Treasurer*—A H DE MARCO

Central Atlantic Region

HUDSON-MOHAWK

Chairman ..... ALBERT E HERRMANN, JR, General Aniline Works, Rensselaer, N Y
Secretary ..... MAURICE FISHMAN, Lee Dyeing & Finishing Co, Johnstown N Y
Vice Chairman—E A CHEVRETTE *Treasurer*—J W MERRILL

NEW YORK

Chairman ..... DONALD E MARNON, American Aniline Products, Inc, 50 Union Sq, New York 3, N Y
Secretary ..... RICHARD P MONSAERT, JR, Puritan Piece Dye Works, Inc, 550 E 38th St, Paterson, N J
Vice Chairman—J A KOMNINOS *Treasurer*—R E MILLER

NIAGARA FRONTIER

Chairman ..... JOHN WALLACE, Supersilk Hosiery Mills, 1151 Florence St, London, Ontario, Canada
Secretary ..... KENNETH A LISTER, Canadian Industries Ltd, 92 King St E, Hamilton, Ontario, Canada
Vice Chairman—W H LEYKING *Treasurer*—A M VIDITZ-WARD

PHILADELPHIA

Chairman THOMAS H HART, Hart Products Corp, P O Box 5025, Philadelphia 11, Pa
Secretary ERNST W EMPTING, General Dyestuff Co, 123 S 2nd St, Philadelphia 6, Pa
Vice Chairman—E BURRELL *Treasurer*—D W ROBINSON

Southern Region

PIEDMONT

Chairman....CLARENCE HOOPER, Burlington Industries, 427 S Broad St, Burlington, N C
Secretary .....WARREN E RIXON, Carbide & Carbon Chemicals Co, 112 S Tryon St, Charlotte, N C
Vice Chairman—C O STEVENSON *Treasurer*—J C KING

SOUTH CENTRAL

Chairman....WILLIAM F LUTHER, Dixie Mercerizing Co, Chattanooga 1, Tenn
Secretary ERNEST V HELMS, Geigy Dyestuffs, Div Geigy Chemical Corp, 276 S Crest Rd, Chattanooga 4, Tenn
Vice Chairman—J C WHITT *Treasurer*—F E CATER

SOUTHEASTERN

Chairman..JAMES W SWINEY, Fulton Bag & Cotton Mills, Atlanta, Ga
Secretary....EDWARD R RAVENEL, Morton Salt Co, Decatur, Ga
Vice Chairman—W B GRIFFIN *Treasurer*—W E FAYSSOUX

WASHINGTON

Chairman..GEORGE S BUCK, JR, National Cotton Council of America, 1832 M St, NW, Washington 6, D C
Secretary...NELSON F GETCHELL, National Cotton Council of America, 1832 M St, NW, Washington 6, D C
Vice Chairman—G P FULTON *Treasurer*—L R MIZELL

Western Region

MID-WEST

Chairman ..... ARTHUR I HULTBERG, Bear Brand Hosiery Co, Kankakee, Ill
Secretary ..... WARREN B BROADBENT, Geigy Dyestuffs, 629 W Washington Blvd, Chicago, Ill
Vice Chairman—S M LITTLEJOHN *Treasurer*—K M HARMS

PACIFIC NORTHWEST

Chairman..ROBERT E NEWMAN, Jantzen Knitting Mills, Portland Ore
Secretary..FREDERICK H HILENBURG, National Aniline Div, Allied Chemical and Dye Corp, 730 Burnside St, Portland 9, Ore
Vice Chairman—A H McKENZIE, JR *Treasurer*—D W KIMSEY

PACIFIC SOUTHWEST

Chairman..ROBERT A FLIEGEL, National Dyeing & Finishing Corp, 3505 Hayden Ave, Culver City, Calif
Secretary..CLARICE H LINDSEY, Univ of Calif, Dept of Home Economics, Los Angeles 24, Calif
Vice Chairman—R D ANDERSON *Treasurer*—W M CAMPBELL

NOTICE TO AUTHORS OF PAPERS

MANUSCRIPTS for the *Proceedings* and for other publications of the American Association of Textile Chemists and Colorists shall conform to the requirements and standards given in this *Notice*. Before publication, manuscripts for the *Proceedings* shall be approved by the Editor, not only for editorial correctness according to the standards of this *Notice*, but also for content of technical matter. In his work, the Editor may enlist the aid of anonymous reviewers who are selected for expert knowledge in particular fields.

It is presumed that authors in studying the comments of reviewers and of the Editor will remember that all recommendations are made in a kindly, helpful, sympathetic manner to improve the paper in both literary and technical excellence. Although authors should cheerfully consider suggestions, they are expected to defend their position if justified, especially when strictly technical matters are involved with which the authors have an intimate knowledge.

AATCC strives to maintain a high scientific and professional standard for papers. Authors must make every effort to avoid the use of trade names, commercial products or process names wherever such use may be construed as advertising. Wherever possible, scientific nomenclature must be employed. It is recognized that in some instances trade names are necessary to avoid lengthy description. Certain trade names have been so widely used as to become generic and these normally are permissible. Further, some technical papers may involve the presentation of a new product or process wherein trade name reference is obligatory.

Giving due consideration to such valid exceptions, it is incumbent upon the author to maintain the proper scientific attitude, avoiding any expressions or devices aimed at promoting a particular product or process.

Questionable papers are to be referred to the chairman of the Publications Committee, who will submit them to an editorial board which would be appointed as needed. The Board would report to the Publications Committee, which would have the final voice in accepting or rejecting a paper.

MANUSCRIPTS — Manuscripts shall be typewritten double-spaced with approximately one-inch margins on 8.5x11-inch white paper. In addition to the *original*, at least one carbon copy is required. Pages are to be numbered consecutively with Arabic numerals, and each page after the first shall carry the authorship at the very top. Tables and figures shall also be numbered consecutively, the tables with headings containing Roman numerals as TABLE I, TABLE II, etc, and the figures with Arabic numerals as Figure 1, Figure 2, etc, appearing *below* the figures. The names of the authors and their laboratories or business connections should appear below the title of the paper.

LITERARY STYLE AND FORM OF PRESENTATION—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "DISCUSSION" after the main body of the paper. Finally, there may be a brief section at the end entitled "SUMMARY" or "CONCLUSIONS."

Center and side headings make for easier reading. Center headings should be employed sparingly and generally will include only very important section headings, such as "INTRODUCTION," "EXPERIMENTAL," "DISCUSSION," "CONCLUSIONS," "SUMMARY," and "REFERENCES." Side headings (see sixth paragraph of this *Notice* for an example) shall be indented and run into the text to which they apply, and shall be separated from the paragraph by a dash. The publisher will print center headings in bold-face capitals and side headings in capitals.

LITERATURE REFERENCES AND FOOTNOTES—References to the literature and all footnotes (except those in tables) shall be numbered consecutively with underlined Arabic numerals in parentheses at the proper place in the text. Where a reference or footnote is to be used again, the original number is simply repeated; this obviates the necessity of repeating the footnote or reference at the bottom of the page. References to the literature shall conform to the universal usages followed by *Chemical Abstracts*, which include underlining of journal names to indicate italicization in printing.

The spelling and rules of punctuation followed in manuscripts shall be those found in the "Merriam-Webster New International Dictionary"; abbreviations and chemical formulas shall conform to *Chemical Abstracts*.

FIGURE AND GRAPHS—Figures and graphs should be black line drawings on white drawing paper. Photographic prints are acceptable, preferably glossy prints on double-weight paper. Duplicates should be available for dispatch to reviewers. In graphs the frame and actual curves should be inked more heavily than the co-ordinate lines, and these latter should not be too close together. Various styles of broken lines are sometimes desirable to distinguish curves. Experimental points should be given with small plane figures, such as circles, squares, diamonds or triangles. Numbers and legends on co-ordinate axes are to be lettered in the graph by the author. Numbers and titles of figures should be placed below the diagram or on the edge of the back. Each piece of illustration copy should bear on the margin or on the edge of the back the name of the author and the title of the paper.

SYNOPSIS — A separately written synopsis of not over 200 words containing the gist of the subject matter must accompany every manuscript.

GALLEY PROOFS—Galley proofs will be sent to the author by the publisher for correction before publication. This should not be interpreted as an invitation to re-write the paper but rather as an opportunity to correct errors.

REPRINTS — Fifty reprints of papers published in the *Proceedings* will be furnished without charge by the publisher if requested when galley proofs are returned. These reprints are printed on one side of the sheet only and then stapled together. A schedule of prices of reprints in the usual form accompanies the galley proofs.

OWNERSHIP OF COPYRIGHTS AND PATENTS — All papers presented at general meetings of the Association or at meetings of any of its local sections and all communications shall become the property of the Association. Such papers are not to be published elsewhere until they have appeared in the *Proceedings* of the Association. Papers published in the *Proceedings* are copyrighted by the Association. Any patentable disclosures shall of course remain the property of the author or authors.

TRADE-MARKS—As the AATCC wishes to co-operate in the protection of trade-marks, it is requested that, in the body of the article, trade-marks be written with an initial capital letter.

A STUDY OF THE DESTRUCTIVE ACTION OF HOME GAS-FIRED DRYERS ON CERTAIN DYESTUFFS

MIDWEST SECTION

COMMITTEE

Arthur I Hultberg, *Chairman*
David A Anderson
Andrew F Blackburn
Harry W Ericson
Bernard Fay
Walter H Jaeger
Joseph H Jones
Jack G Kelley

This investigation was prompted by a series of complaints that fading of cotton textiles colored with dyes considered fast to washing occurred in home gas-fired dryers. This type of fading, traced to combustion products of the gas, is characteristic of those dyestuffs which are sensitive to oxides of nitrogen while the textile material is in the wet state. It is not confined to any group of dyestuffs. A laboratory procedure, using acidified nitrite solution, has been devised which can predict the sensitivity of dyes on cottons in home gas-fired dryers. Although additional work is indicated, it was requested that this article be published as a matter of general interest.

INTRODUCTION

COMPLAINTS of fading of cotton textiles colored with dyes considered fast to washing have been traced to gases formed in home-fired dryers. This destructive action is selective to those dyestuffs which are sensitive to oxides of nitrogen while the textile material is in the wet state. The fading is not confined to any group of dyestuffs. Methods for testing for gas fading on acetates will not show which dyestuffs will fade on cotton. Attempts were made to devise an accelerated testing procedure which would disclose which dyes were subject to fading.

CAUSATIVE FACTOR OF GAS FADING

Dyeings were made on knitted cotton material with vat dyes. Two identical sets of dyeings were washed ten times. One set was dried in an electrically heated dryer; the other set was dried in a gas-fired dryer. It was noticed that blue dyeings that had been dried in the gas-fired dryer had turned greener and had lost some color intensity. This seemed to indicate combustion products of the gas as a possible cause of fading. Following this, the American Institute of Laundering made tests in the standard gas-fading chamber. These tests revealed that no fading occurred if the goods remained dry, but if they were moistened at the start of each cycle, fading did occur, somewhat more strongly than on the first tests in the gas-fired dryer.

Meanwhile, tests were made with carbon dioxide, sulfur dioxide, hydrogen sulfide, and acidified sodium nitrite, as possible contaminants of air due to combustion products of burning gas. Of these reagents, only acidified nitrite showed any effect. Since oxides of nitrogen appeared to be the causative factor, an attempt was made to devise an accelerated test method.

ACCELERATED TEST METHOD

I. Preliminary Series of Tests

RANGE OF DYESTUFFS —— Included in this series of tests were vat dyeings, soluble vats, sulfur colors, naphthol combinations, developed dyes and direct colors, aftertreated with resin-copper complexes.

EXPERIMENTAL —— The various dyeings were dipped into a solution containing four grams each of sodium nitrite and glacial acetic acid per liter of distilled water, squeezed by hand and pressed dry between filter papers. The process was repeated ten times, and after the ten immersions and dryings the test specimens were thoroughly rinsed in running cold water to remove any traces of sodium salts, then pressed dry. Simultaneously, pieces cut off the same dyeings were soaked in water, squeezed and dried in a gas-fired dry box ten times. The shades were then compared with those of the original dyeings.

RESULTS —— With the above concentration of nitrite and acid, any shade changes were roughly alike in direction as compared with those which were dried in the gas-fired dry box, but the shades were very much more adversely affected. Some of the dyeings were badly affected, some slightly affected and some not affected at all.

II. Additional Series of Tests

RANGE OF DYESTUFFS —— In this series were included another series of vat, naphthol and sulfur dyeings, also some prints.

EXPERIMENTAL —— Since the preliminary test solution as made was too strong to give a proper evaluation of the effect of oxides of nitrogen, it was decided to reduce the concentration of nitrite and acid so that ten dips with subsequent dryings would come close to ten wettings with water followed by dryings in the gas-fired dry box. It was found that 0.4 grams sodium nitrite and 0.4 cc glacial acetic acid per liter came close to satisfying these conditions.

RESULTS —— The net result of the last series of tests disclosed that, while there were some very slight differences in shade between the tests and controls on some dyeings, the instances were few and the degree of fading was not great enough to warrant customer complaints. Only exceptions were the blues of the chlorinated Indanthrene types (*Colour Index* 1112 and 1113) and compound shades in which these dyes were used. The effect was a slight fading and shade shift toward green, also a slight dulling of the shade. It was found that the shade could be restored by treating with a mild hydrosulfite bath, just as in cases of overoxidizing with bichromate or the effect of chlorine on dyeings of these blues.

CONCLUSIONS

A laboratory test method has been devised to predict fading due to oxides of nitrogen (combustion products) in gas-fired dryers. This method described in Part II above utilizes a dilute sodium nitrite and acetic acid solution.

This test may be accelerated if an optimum nitrite-acid concentration could be found which would produce with one or two dips a degree of fading comparable to that of wetting and drying ten times in gas-fired dryers.

Piedmont Section ———

A STUDY OF WASH AND WEAR COTTONS*

CHARLES R WILLIAMS
Monsanto Chemical Company
Springfield, Mass

A representative sampling of commercial cotton fabrics was analyzed for a large number of physical properties, and given a subjective "wash and wear" ranking.

No physical property was found that correlated with the ranking as such, but when the printed fabrics of extreme pattern and color were removed from the group, a significant linear relationship with wrinkle recovery was evident.

Laboratory work investigating finishing formulation variables first established that a direct relationship between wet and dry wrinkle recovery existed, after which all work was performed with the dry wrinkle recovery test.

A series of experiments established that wrinkle recovery alone was the mechanism by which a resin improved W & W, and that resinification was detrimental, thus indicating the dimethylol cyclic ethylene urea type, by virtue of its greater wrinkle recovery effect and lack of resinification, to be the best resin for W & W.

The effect of various common additives to resin formulations was also determined, the general conclusion being that they have little or no beneficial effect on W & W, and should be included only for their influence on other properties.

INTRODUCTION

"WASH and wear" cottons represent another significant contribution by the textile industry to the comfort and pleasure of the consumer. The recent, very rapid growth of "wash and wear" cottons indicates a growing acceptance of this fact.

It is also accepted that "wash and wear" cottons depend in part on resin-finishing techniques, the technology of which has been well developed through recent years. However, little direct reference to "wash and wear" characteristics, and their relation to resin finishing, is to be found in the literature, with the notable exception of one recent paper (*1*).

The purpose of this paper is to present some of the data, and the practical implications thereof, arising from work carried out in the textile laboratory of Monsanto Chemical Co on "wash and wear" cottons. It is hoped that this will serve in part to clarify certain aspects of the subject, and direct attention to those areas needing further study.

Apart from a general identification of the factors involved, it is intended to consider in detail only that aspect in which we are reasonably proficient, that of resin finishing.

The first section of this paper deals with attempts to identify and define "wash and wear" characteristics on 24 commercial fabrics, and with attempts at discerning relationships between these characteristics and the other fabric properties. A subjective "wash and wear" evaluation and a large number of fabric property tests compose the experimental approach in this section.

In the second section, the effects of the major components of finishing formulations on "wash and wear" properties are examined, and underlying principles of formulation for "wash and wear" are proposed.

The concept of "wash and wear" upon which this work is based holds that the ideal "wash and wear" fabric or garment is one that after washing and drying presents, with no further care, the ultimate in appearance. The degree to which a fabric approaches this ideal state is therefore a measure of its "wash and wear" properties, and is what we concern ourselves with here. For convenience, this property is hereafter referred to simply as W & W.

The scope of this work is of necessity limited primarily to consideration of W & W. It has not been possible to discuss fully all of the other factors which must also be considered in commercial practice. However, the other factors of practical importance are identified, and more detailed treatment of these is available in the literature (*2*).

SECTION I

A total of twenty four commercial, resin-treated cottons were gathered together, primarily by purchase from the shelves of consumer stores, but with some mill-trial samples direct from the manufacturer included. These fabrics represented many of the well-known brand names in the cotton field, and ranged in their advertising claims from wrinkle resistant to no iron cotton. Many were claimed to require no, or very little, care or ironing.

A subjective procedure for the evaluation of W & W properties, developed and used by a producer of resin-treated cottons (*3*), and slightly modified to fit available washing equipment, was used to rank the fabrics.

This procedure consisted of washing a 15″-square sample of each fabric in a revolving cylinder-type washer with normal load, with detergent, at 160°F, for 20 minutes, followed by two 5-minute rinses at 160°F and 100°F respectively. The samples of fabric were then removed and hung to air dry.

Subjective classification was performed as follows: the fabrics were laid on a flat surface in a room with no artificial light, whose only light came from windows with a direct northern exposure. The samples were thus exposed to diffuse, oblique light.

Each member of a panel of six judges was then required to classify each fabric sample into one of four categories, as follows:

NP—no pressing required,
LNP—little or no pressing required.
SP—some pressing required, and
RP—required pressing.

The judgment of appearance was based on three factors:

1) creasing—the presence of a single line,

2) wrinkling—the result of intersection of two or more creases, and

3) rippling—the peculiar puckered or seersucker effect where the fabric does not lie flat, in one plane.

By arranging the fabrics in different groups, two judgments of each sample by each judge were obtained. The samples were then ranked from one to 24 in the order of the summations of the judgments. For example, a sample receiving 4 NPs and 8 LNPs would be ranked better than one re-

*Presented before the Piedmont Section on February 4, 1956 at Greenville, S. C.

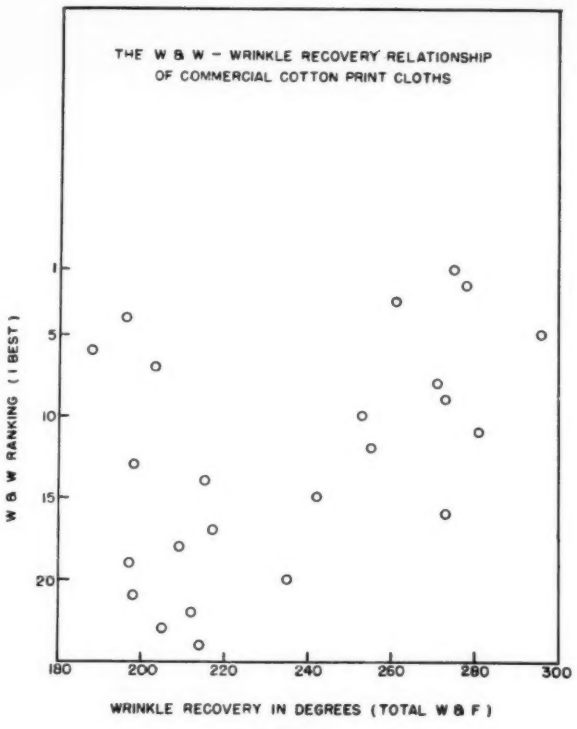


Figure 1

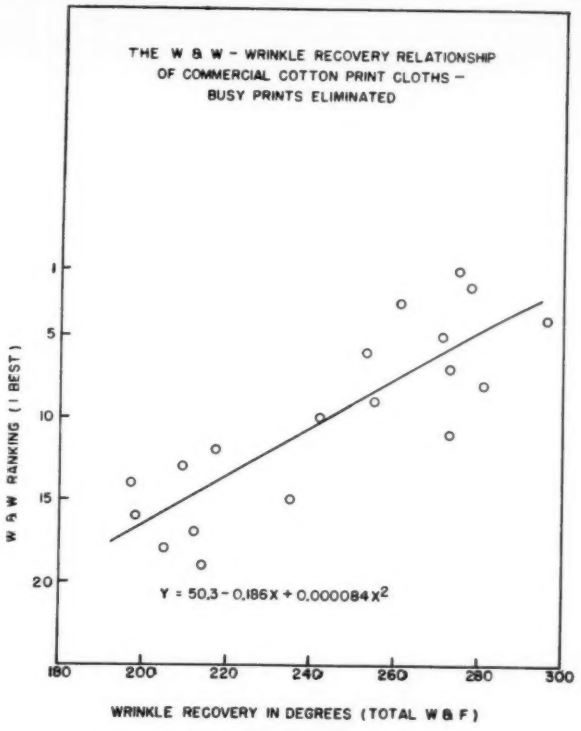


Figure 2

ceiving 3 NPs, 8 LNPs, 1 SP.

This procedure was run in duplicate, with the two rankings being compared and showing good agreement, after which the results were averaged to give a ranking based on an average of 24 individual judgments per sample.

Fabric construction, weight, wrinkle recovery, wet wrinkle recovery, tensile and tear strengths, wet and dry stiffness, float time, drying rate, dynamic absorption, hot chlorine yellowing, the durability of some of these properties to laundering, and yarn count, twist and crimp, were determined on these fabrics, and the results studied for correlation with the W & W ranking. Particular attention was devoted to the relationship of W & W with wrinkle recovery.

At first, no correlation of W & W with any property was evident, as may be seen graphically in Figure 1 for wrinkle recovery. In fact, this data justified the conclusion that on commercial fabrics, no direct correlation of W & W with any one fabric property exists. This in turn indicated that at least two and probably more factors influence W & W.

Further study of this data indicates some of these factors. Approximately half of the fabrics examined were prints, with the rest being yarn-dyed ginghams, checks, and plaids, and plain shade fabrics. Some of the prints were symmetrical, with small patterns and large unbroken background areas, whereas others were extremely busy prints, with little background, nonsymmetrical patterns, and contrasting colors. Because these latter fabrics had been particularly difficult to judge and classify it was desired to determine the effect of eliminating them from the data. The result of their elimination is presented in Figure 2.

Correlation analysis of this data indicated a relationship of extremely high significance[1]. Analysis for a possible nonlinear relationship resulted in a quadratic term of insignificant magnitude. Thus, it could be concluded that a simple, linear relationship between W & W and wrinkle recovery exists in the absence of extreme pattern and color effects.

In turn, it would appear from this that the optical properties of pattern and color have powerful influence on W & W. It seems to matter little whether wrinkles or ripples are present if one cannot see them. It is also shown that when the masking influence of the optical properties is removed, the major factor remaining appears to be wrinkle recovery. The scatter observed would be due in part to the color and patterns still present, or to finishing variations.

It has already been indicated (*1*) that fabric construction plays a part in W & W, and here the influence of two other factors is evident. It appears from this that the basic approach to W & W must involve a separate study of each major factor by those best qualified to do so. Thus, the fabric designer, the weaver, the printer, and the finisher must each learn the influence of the factors he controls, and adapt that knowledge into practical concepts, for only by a combination of best efforts can the best W & W cottons be made.

The most effective print cannot be W & W without a good construction and some resin. Plain shades will require the optimum in fabric construction and the maximum finishing effect to be W & W. The consumer demands ginghams and plaids and checks and all manner of prints, which must be compensated for W & W with design, weaving and finishing techniques.

The textile industry is far more capable than we in evaluating factors

[1] The criterion for correlation significance used throughout this work is a 99.9% confidence level. In testing the significance of the deviation as in Figures 6 and 8, 95% confidence limits have been applied.

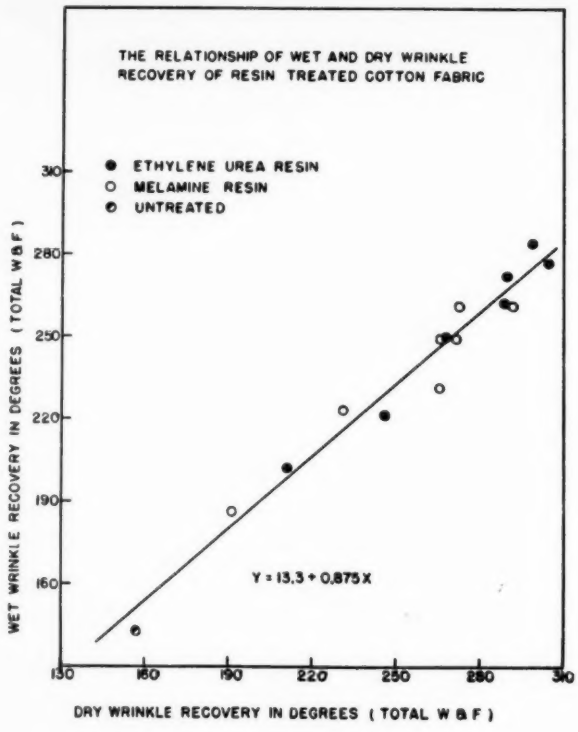

THE RELATIONSHIP OF WET AND DRY WRINKLE RECOVERY OF RESIN TREATED COTTON FABRIC
ETHYLENE UREA RESIN
MELAMINE RESIN
UNTREATED
WET WRINKLE RECOVERY IN DEGREES (TOTAL W & F)
Y = 13.3 + 0.875X
DRY WRINKLE RECOVERY IN DEGREES (TOTAL W & F)

Figure 3

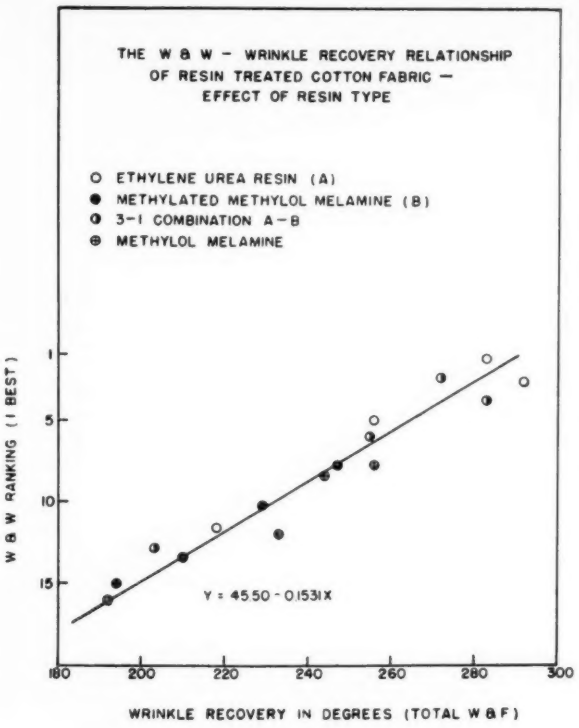

THE W & W - WRINKLE RECOVERY RELATIONSHIP OF RESIN TREATED COTTON FABRIC — EFFECT OF RESIN TYPE
ETHYLENE UREA RESIN (A)
METHYLATED METHYLOL MELAMINE (B)
3-1 COMBINATION A-B
METHYLOL MELAMINE
W & W RANKING (1 BEST)
Y = 45.50 - 0.153IX
WRINKLE RECOVERY IN DEGREES (TOTAL W & F)

Figure 4

such as fabric construction, weave, pattern and color, and undoubtedly is doing or has done so. As our primary interest is in resin finishing, in the following work we have sought to eliminate and control these other factors, so as better to examine the effects of finishing variables, particularly those of formulation, on W. & W.

SECTION II

The correlation of W & W with wrinkle recovery obtained previously, and the possibility that the ability of a washed fabric to recover from deformations might well depend upon its ability to recover when wet, led to investigation of the relationship of "wet" to "dry" wrinkle recovery.

To do this, samples of an 84 x 76, plain weave, desized and bleached cotton print cloth (plain white, the same fabric as used throughout the rest of this work) were treated in the following manner. Formulations containing 3, 6, 9, 12, 15, 18 and 21% solids of dimethylol cyclic ethylene urea with 10% of an amine hydrochloride catalyst product on resin solids, and an identical series with an essentially monomeric methylated methylolmelamine resin, were prepared. The fabric samples were wet out in these formulations, padded to approximately 80% wet pick-up, framed to original dimensions, dried 3 minutes at 212°F; and cured 3 minutes at 310°F.

These samples were first tested for "dry" wrinkle recovery under standard conditions (70°F, 65% R H) using the Monsanto Wrinkle Recovery Tester, by AATCC Test Method 66-53 (4), using a five-minute recovery period. "Wet" wrinkle recovery values were determined by the same procedure, with the following amendment. In place of conditioning, the test specimens were immersed for 5 minutes in a water solution of 0.25% Santomerse S, removed, placed between two pieces of blotting paper to remove excess moisture, and immediately started in the test.

The "wet" values were then plotted as a function of their respective "dry" values, as seen in Figure 3. Correlation analysis of the data indicated an extremely significant linear relationship to exist over the entire range of wrinkle recovery values and resin solids applied. No difference between the two resins in the wet to dry relationship produced could be detected.

The obvious conclusion is that the same mechanism of recovery is governing in both the wet and dry states, and thus "dry" wrinkle recovery is as good a measure of ability to recover when wet as is "wet" wrinkle recovery. This is equally true for finishes produced with the reactant type of resin and those produced with a resin capable of both crosslinking and polymerization.

With this point established, it was desired to examine the relationship of W & W with (dry) wrinkle recovery, for the basic types of resins currently employed in cotton finishing. Toward this end, 3,6,9 and 12% solids formulations of dimethylol cyclic ethylene urea, methylated methylolmelamine, a 3/1 ratio of these two, and a methylol melamine, all catalyzed with an amine hydrochloride catalyst, were applied to samples of the same 84 x 76 cotton fabric used previously, by identical procedure.

The wrinkle recovery of these samples was determined by Method 66-53 as before (70°F, 65% RH), but the evaluation procedure differed from that used previously. The washing, drying, and viewing procedure was the same, and the judging criteria remained unchanged, but in place of classification into categories, the samples were ranked in order, relative to each other, by each judge. Thus, in this experiment, the samples were ranked from 1 (best) to 16 (worst) by each judge. The average ranking of each sample was determined by totaling the numerical value received by that sample from each judge and dividing by the number of judges

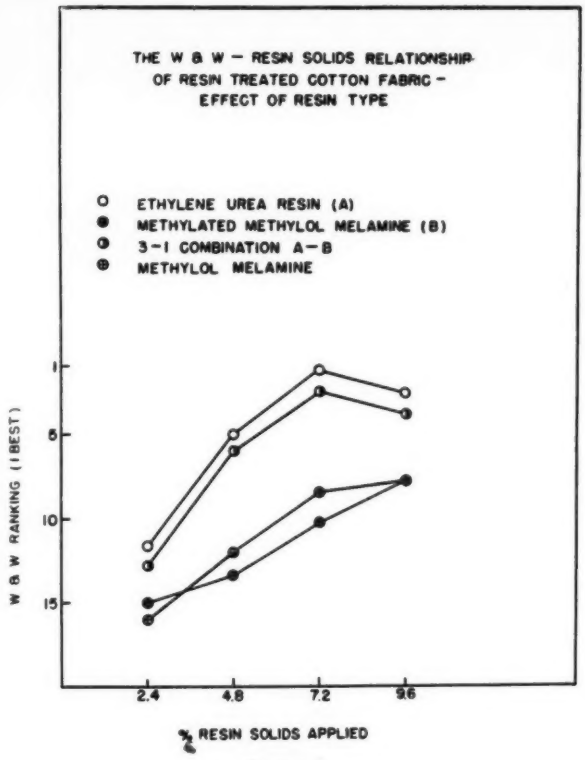


Figure 5

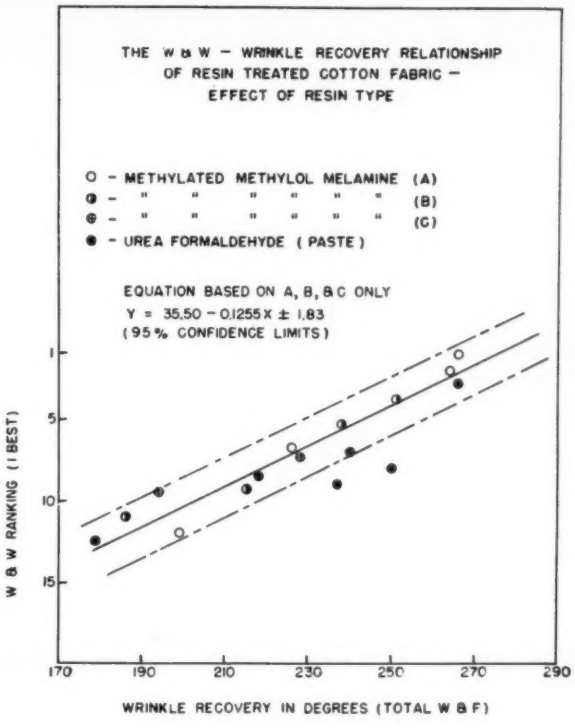

THE W & W – WRINKLE RECOVERY RELATIONSHIP
OF RESIN TREATED COTTON FABRIC –
EFFECT OF RESIN TYPE
○ – METHYLATED METHYLOL MELAMINE (A)
◑ – " " " " " " (B)
◔ – " " " " " " (C)
● – UREA FORMALDEHYDE (PASTE)
EQUATION BASED ON A, B, & C ONLY
Y = 35.50 – 0.1255 X ± 1.83
(95 % CONFIDENCE LIMITS)
W & W RANKING (1 BEST)
1
5
10
15
170
190
210
230
250
270
290
WRINKLE RECOVERY IN DEGREES (TOTAL W & F)

Figure 6

(eg, a sample ranked 1st by four judges and 2nd by two has an average rank of 1.33).

Although this ranking technique gave relative values only, with no measure of W & W on an absolute basis, it was adopted because of its far greater precision, the judges being capable of discerning several gradations in each of the four categories used previously.

Every effort to control variables and eliminate bias in these ranking experiments was made. Samples were always coded in a random manner so that no trends with sample numbers would occur, and were randomly placed for judgment. The judges always made their rankings individually with no knowledge of how the others had ranked the samples. To avoid handling of the samples, rankings were made by listing sample numbers in the proper order on paper, rather than by rearrangement of the samples. No differential weighing of the judges' rankings (counting one judge's ranking twice, another's once), based on experience or proficiency, was made, as the correlation between the individual ranking and the average ranking was very much the same for all judges. Good agreement between all judges was observed, with one exception noted later.

Plotting these average ranks as a function of wrinkle recovery, Figure 4 is obtained.

A linear correlation of extreme significance results from this experiment. None of the values produced by any of the resins deviate significantly from the correlation line of the entire population of data. The degree of variability, or scatter, of this data is considerably less than that of Figure 2.

Elimination of all color and pattern is probably responsible for reducing the scatter evident in Figure 2, although it cannot be concluded that color and pattern were the sole influences in the variation evident there. The fact that resins of three markedly different types form the same W & W-wrinkle recovery correlation line is an extremely powerful indication that wrinkle recovery (or the change in physical characteristics that gives rise to wrinkle recovery) is the only mechanism by which resin finishing can improve W & W performance.

The fact that these resins all produce the same W & W-wrinkle recovery relationship should not be construed to mean that they are equivalent in producing W & W. On the contrary, the resins differ in their effects on W & W, because they vary in the efficiency with which they produce wrinkle recovery.

This is graphically demonstrated in Figure 5, where the W & W data of Figure 4 are replotted as a function of resin solids. The ethylene urea is obviously superior, in W & W effect, to the melamines on an equal solids basis. This figure also indicates either a peak or a plateau of W & W effect with increasing solids, a point we shall consider later in more detail.

Here, as elsewhere in this paper, conclusions made concerning W & W performance should not be too broadly interpreted for practical purposes. In this instance, the very important factor of hand, decidedly an advantage of the melamines, must be balanced against the superior W & W of ethylene urea before an intelligent choice of either resin for a particular formulation can be made.

Another experiment was performed, identical to the previous one except that a urea-formaldehyde paste resin, the essentially monomeric methylated methylolmelamine used previously, and two slightly advanced methylated methylolmelamines were applied. (Here, as throughout this work, 10% of an amine hydrochloride catalyst on thermosetting resin solids was included in each formulation.)

Figure 6 represents the results of this experiment. Correlation is again highly significant, but more variance is present than in the previous experiment.

As the urea-formaldehyde resin appeared to be the cause of this increased variance, the data were analyzed by eliminating the urea-formaldehyde values, determining the correlation line (least squares equation, Y in terms of X) and its variance, and plotting the equation based on 12 ranks, with the urea-formaldehyde values placed in the same relative positions that they occupied prior to the statistical analysis. Thus, it is seen in Figure 6 that the two highest urea-formaldehyde solids applications gave values significantly different from the correlation, being lower in W & W at a given wrinkle-recovery vaiue.

The fact that all other resins, in the solids range considered, yield an identical W & W-wrinkle recovery relationship, and that the urea-formaldehyde resin has the greatest propensity to polymerize of all the resins considered, indicates the possibility that resinification (polymerization, as opposed to cellulose crosslinking) may be detrimental to W & W.

The slight peaking effect seen in Figure 5, and the deviation evident in Figure 6, prompted investigation of higher resin solids applications. The first experiment in this direction involved the application of 3, 6, 9, 12, 15, 18 and 21% solids formulations of dimethylol cyclic ethylene urea, by the identical procedures used previously, and determination of W & W ranking and wrinkle recovery. This experiment was also performed with a methylated methylolmelamine, a methylolmelamine, an advanced urea-formaldehyde, and a paste urea-formaldehyde resin.

Figure 7 presents the W & W ranking and wrinkle-recovery values obtained with the ethylene urea resin, as a function of resin solids applied. It is noted that the wrinkle recovery rises rapidly at first, increasing at a decreasing rate until a plateau is reached at about 9% solids, after which wrinkle recovery increases hardly at all.

W & W follows a similar pattern, until it reaches the point where the wrinkle recovery plateau is well established. Here, instead of remaining at the same level, the W & W property starts a rapid decrease with increasing resin solids, resulting in a peak, or maximum W & W value.

It will be noted that the shape of the W & W curve does not correspond to that of the wrinkle-recovery curve at low solids. This is due to the fact

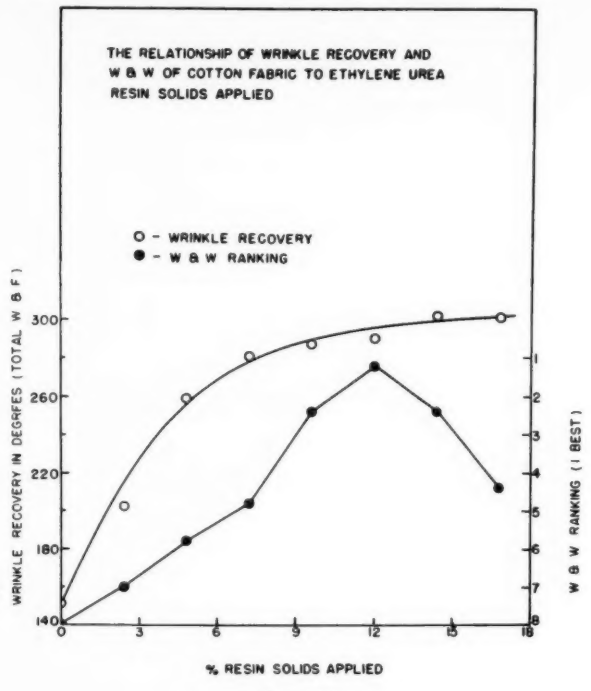


Figure 7

that the W & W ranking is a relative value and depends upon the distribution of the samples tested. With five samples between 280-300°, and only three between 150-280°, the higher range is accentuated unduly. With samples distributed evenly over the range of wrinkle-recovery values, a W & W curve closely approximating the wrinkle-recovery curve at lower solids would result.

Without exception, this same pattern was observed for each resin investigated, so that an optimum resin concentration for W & W, which occurs where wrinkle recovery no longer is increasing rapidly with resin solids, exists for all commercial thermosetting textile resins. Obviously, above this concentration, the W & W-wrinkle recovery relationship no longer exists.

The propensity for a resin to polymerize influences the concentration at which optimum W & W occurs, generally having a decreasing effect. The urea-formaldehyde paste resin peaks at 5-7% solids deposited, which accounts for the deviation of this resin from the correlation in Figure 6, at the higher solids levels. In addition, because the resins plateau at different wrinkle recovery levels, the highest absolute value of W & W attainable varies from resin to resin, with the ethylene urea resin being best, and the urea-formaldehyde worst in this respect.

It is felt that perhaps two factors are responsible for these results.

First, the further embrittlement of the fiber, where no proportionate increase in wrinkle recovery occurs, may reduce the yield point to a value where deformations during washing surpass it, and cause this decrease in W & W at the higher solids. Whenever the yield point of a material is exceeded, permanent, irreversible deformation occurs, and the fabrics treated with these high resin concentrations exhibit indications of this. A myriad of sharp, well-defined wrinkles and creases, which do not recover in spite of high wrinkle recovery, are evident on these samples.

The second factor in reducing W & W at high solids would appear to be an increase in stiffness or rigidity of the fabric, due to polymer formation. This effect would be greatest, and appear at lowest solids, with the resin having the greatest tendency to polymerize; and would decrease in effect with a decrease in polymerization capability. This is adequately supported by the experimental data.

The appearance of these high resin solids fabrics was also responsible for the only substantial disagreement between individual judge's rankings, as some placed more importance on these small sharp wrinkles and creases than others did. However, as the region where this occurs is beyond that considered practical for W & W, this difference of opinion is only of aca-

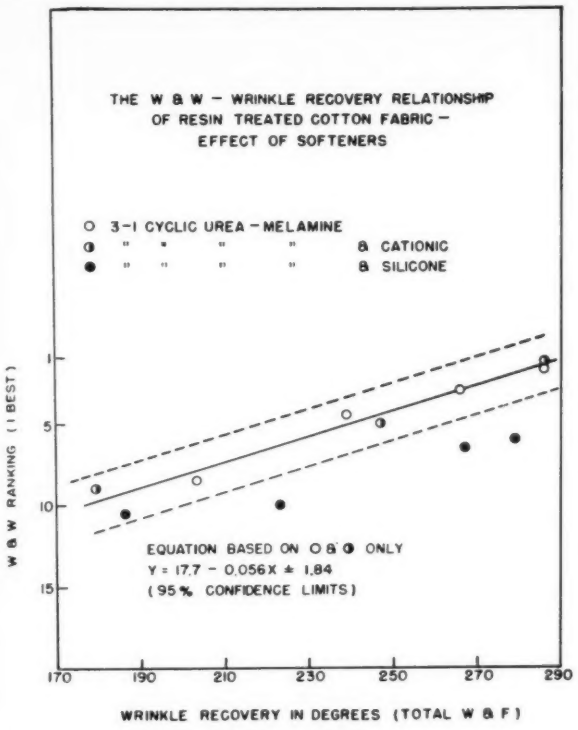


Figure 8

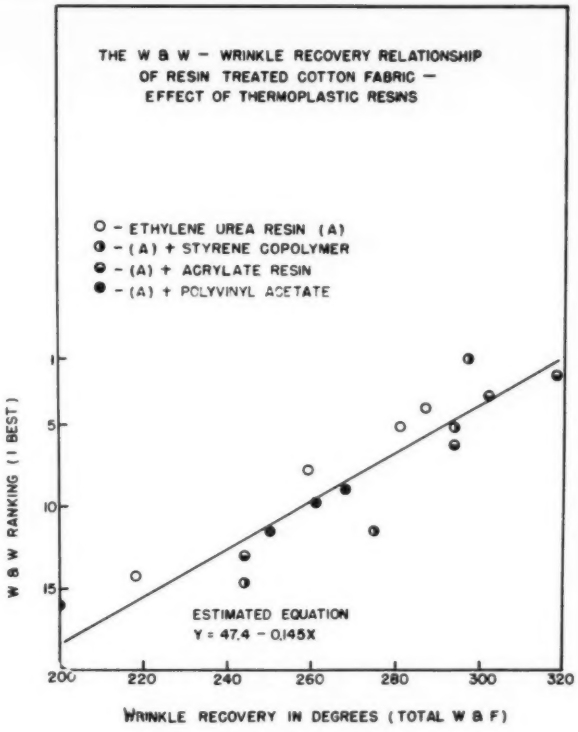


Figure 9

demic importance.

The samples in the region of the optimum concentration are very close together in W & W characteristics, much more so than in the region of rapidly increasing wrinkle recovery. As a result, the optimum concentration cannot be determined exactly. A degree of variability results, as indicated in Figures 5 & 7, where the optimum concentration for W & W varies between 8 and 12% solids for an ethylene urea resin. Further experiments with this resin placed the optimum range for W & W at 10-12% solids, but the point is clear: the optimum resin concentration for W & W alone is not coincident with optimum resin concentrations for commercial W & W.

The optimum commercial resin solids application for W & W would be at that concentration where wrinkle recovery no longer increases rapidly with solids. As an example, in Figure 7, for an ethylene urea resin, 6-7% solids deposited would probably be best from an economic point of view.

Although the resin is the basic factor in improving wrinkle recovery and W & W, other components are included in commercial formulations for the purpose of influencing hand, tear strength, sewability, and a host of other factors. The influence of these components on W & W and other properties must be known to enable preparation of optimum formulations. These additives may be classified into two groups, softeners, and hand-modifying agents, both of which were investigated as indicated in the following.

Among the prime functions of a softener are those of preventing inordinate tear strength loss, and imparting sewability, both of which are based in large degree on lubricity. The two types of materials commonly used are the cationic substantive materials, and some of the silicone resins which also impart water repellency.

Using the identical fabric, application procedures, and evaluation procedures of the previous experiments, formulations of 3, 6, 9 and 12% solids of dimethylol cyclic ethylene urea, alone, with 10% cationic substantive softener on the resin, and with 2% on the formulation of a 40% solids silicone resin emulsion, with its catalyst, were applied. The wrinkle recovery-W & W relationship of these formulations, presented in Figure 8, gives a rather unexpected result.

The resin-silicone formulation, still showing a definite W & W wrinkle-recovery relationship, is significantly displaced, in a high wrinkle recovery-low W & W direction, from the relationship exhibited by the other formulations.

This experiment was repeated, again showing displacement of the relationship, after which four different commercial silicone products were also examined, and found to exhibit this behavior to some degree. In most of the work, the deviation from the correlation seemed to be caused more by increased wrinkle recovery at constant W & W, than by a detrimental effect on W & W.

This indicates only that silicones do not improve W & W, and does not preclude their use for softening effects in W & W finishes. The cationic softener appears to have no significant effect on W & W, and thus choice of either type of softener must depend on factors such as hand, strength, cost, and chlorine retention, rather than on W & W.

Another experiment, conducted under the same conditions as before, compared 3, 6, 9 and 12% applications of dimethylol cyclic ethylene urea alone, and with 1% solids (on the formulation) of a polyvinyl acetate, a styrene copolymer, and a butadiene-acrylonitrile resin.

The data from this experiment are presented in Figure 9. Although there is indication of a displacement of the correlation by the thermoplastics to

lower W & W-higher wrinkle recovery, statistical significance of the differences between the formulations could not be established on the basis of this experiment. More data points for each formulation, and/or elimination of one or more variables (thermoplastics) would be necessary to reach a conclusion here.

Even with the deviations indicated in Figure 9, the scatter is still considerably less than that observed in our first correlation, Figure 2, so that even here, the significance of the overall W & W-wrinkle recovery relationship is beyond question.

Other observations in this experiment that are of practical significance may be made as follows. The polyvinyl acetate, which appreciably stiffens the fabric, reduced both W & W and wrinkle recovery, so that the formulation is less efficient from a W & W standpoint than any of the others. Similar experiments with other stiffening agents, such as starch ethers and polyvinyl alcohols, produce the same result.

The styrene and acrylate resins seem to have enhanced wrinkle recovery to some degree without improving W & W at the lower, practical range of solids, and at the higher range of solids actually improve the W & W slightly. However, these resins have no effect on the stiffness or crispness of fabric hand, and one tends to impart an undesirable rubbery feel. The practical value of these additives is therefore considered rather slight, from a W & W standpoint, in comparison to the effects to be obtained with an equivalent amount of thermosetting resin.

Apart from the chemical aspects of finishing, a number of mechanical finishing effects (eg, slack versus tension curing, Sanforizing before or after cure) exist which may influence W & W to some degree. Although some indications from mill runs have been obtained, no thorough study has been made. It is best only to indicate that influences other than those discussed here are present and must be considered in commercial finishing of W & W cottons.

DISCUSSION

W & W is inherently an entirely subjective property, influenced by several physical and psychological factors, which in the light of our present knowledge can be fully measured only in a subjective manner. Subjective measurement, as such, has many disadvantages, and for that reason is replaced by objective measurement wherever sufficient correlation exists between objective and subjective.

This work has shown that wrinkle recovery is, for practical purposes, a direct correlate of W & W whenever psychological effects are eliminated, and it would appear therefore, that to this extent, wrinkle recovery measurement can be a valuable tool in the W & W program. Immediately obvious uses are for control testing of production, in the development of formulations, and in investigation of the effects of other factors.

On the other hand, because of the psychological factors which wrinkle recovery does not measure, an absolute W & W scale of standards based on wrinkle recovery is not possible, and continued use of a subjective test will be necessary to define quality standards and the like.

The data presented here should be of value in clarifying the effects of chemical finishing on W & W. Practical utilization of the principles developed here must, however, also depend upon consideration of the many other influencing factors that exist.

CONCLUSIONS

1) No one fabric property is responsible for the W & W characteristics of commercially finished cottons.

2) Print pattern and color, resin treatment, and fabric weave and construction are the most important influences on W & W properties of cotton fabrics.

3) Print pattern and color influence W & W psychologically, by hiding wrinkles, creases and ripples.

4) Resin application influences W & W only by increasing wrinkle recovery, which proportionately minimizes wrinkles, creases and ripples.

5) A fabric with the most deceptive print pattern and color still requires resin treatment to obtain adequate W & W. The less deceptive the print, the higher is the wrinkle recovery required.

6) Dimethylol cyclic ethylene urea is the most effective textile resin for W & W investigated in this work.

7) Methylated and unmethylated methylolmelamine resins are effective for W & W.

8) Urea-formaldehyde resins appear to be not as effective for W & W on any basis of comparison as are the cyclic ethylene urea and melamine types.

9) Choice of any resin will be dictated not only by its relative W & W properties, but by the hand, strength, and other characteristics produced by the entire formulation.

10) The addition of materials other than thermosetting resin and catalyst to a W & W formulation should be held to a minimum, and should be justified by desirable influence on other fabric properties.

ACKNOWLEDGMENT

The author is sincerely grateful to Sayles Finishing Plants, Inc, for the subjective procedure from which our methods derived, to S H Foster for stimulating discussions and suggestions, to Miss P A McPherson, who performed most of the experimental work, and to E C Harrington, for statistical analysis of the data.

REFERENCES

(1) Lippert, A D, "Characteristics of Wash and Wear Cottons," *Textile Research J* 26, 128 (1956).

(2) Foster, S H, "Variables of Cure in the Resin Finishing of Cotton," *ibid* 26, 149 (1956).

(3) Private communication with Sayles Finishing Plants, Inc, Saylesville, R I.

(4) "AATCC Technical Manual and Year Book," page 136 (1955).

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

56-9

Education: Philadelphia Textile Inst, 3 years, general textile course

Experience: technical sales, textile chemicals

Age: 46; married; references; position in Carolinas or Southeast desired.

7-2, 7-16

56-10

Education: High school

Experience: Dyer and foreman, synthetics

Age: 48; married; references; South preferred.

7-2, 7-16

Washington Section—

NEW PAPER PRODUCTS IN COMPETITION WITH TEXTILES*

ROBERT B HOBBS
Chief, Paper Section
National Bureau of Standards
Washington 25, DC

Paper products in competition with textiles are grouped in six categories: packaging and packing, sanitary papers, food service, hospital and medical supplies, clothing and industrial-miscellaneous. Physical and performance characteristics of the products are discussed, and some information on amount and growth of production is given. Basic factors favorable to growth of the paper industry are said to include low cost of product, availability of raw material, new product development and process engineering. The importance of research in developing a strong competitive position is stressed.

INTRODUCTION

THE competition offered to the textile industry by new paper products has been the subject of considerable attention recently. Our discussion will attempt to examine the question from the viewpoint of someone near the paper industry, and to show in what fields the competition lies, and how much of it is actual, how much potential.

When I was asked to talk about new paper products, the first question that came to mind was, "How new is new?" In some of our modern industries dealing with high-polymeric substances, anything more than three to five years old is old stuff. But in the paper industry, which is nearly 2,000 years old, any product that has appeared on the market in the past thirty years can probably be regarded as new. In particular, I shall consider as new any major paper product not specifically listed in the 1939 Census of Manufactures.

A quick survey reveals scores of items that may be considered as being in competition with textiles in some way. For convenience in our discussion, they can be grouped in six categories:

1) Packaging and packing
2) Sanitary papers
3) Food service
4) Hospital and medical supplies
5) Clothing
6) Industrial and miscellaneous

SHIPPING SACKS

In terms of volume of production, bags and sacks occupy the principal area of competition between textiles and paper in the field of packaging, and multiwall shipping sacks probably compose the biggest item in this field. These are used to package more than 400 industrial and agricultural commodities. The Federal specification for shipping sacks lists some 60 different constructions for multiwall sacks, and there are still others used in industry.

The chief groups of uses for paper shipping sacks are agricultural and food products (35 percent), chemicals and drugs (34 percent), and building materials (22 percent). Their use for building materials has tended to decline, percentagewise, in recent years, according to data furnished by the Paper Shipping Sack Manufacturers' Association. This illustrates an important point that will come up elsewhere in our discussion—namely, that textiles and papers are in competition with other materials and practices in a rather complex pattern. The relative decline in the use of shipping sacks for building materials is said to be caused in part by increasing shipments of such products in bulk or carload lots. Cement, for example, is being shipped more and more often in carloads for use in making "transit-mix" concrete at central plants, and shipping it to the job by truck, rather than being shipped to the job in paper sacks and being mixed at the site.

Among the many factors favorable to the use of paper shipping sacks are: protection of the contents against water, dirt, or infestation; prevention of loss by sifting of powdered contents; low cost and tare weight; easy handling; adaptability of the construction for specific products; good advertising surface; and, of course, high strength. Protection against water is obtained with wet-strength resins, lamination with asphalt or waxes, or polyethylene plies. A recent news item told of fire breaking out in the hold of a ship carrying paper mail sacks, and being extinguished with steam. The contents of the sacks were said to be unharmed by the moisture.

The production of paper shipping sacks approximately doubled between 1944 (under 400,000 tons) and 1954. In 1955, according to preliminary data compiled by the Business and Defense Services Administration, it rose further to 829,000 tons. Their production rose rather slowly up until World War II, and indeed was too small to be listed as a separate item in the 1939 Census of Manufactures. War conditions are said to have given a great impetus to their use; possible causes included increased demand for shipping containers, restricted supply of imported fibers for bags, and the need of cotton for other military purposes. It is important to note that the paper shipping sack industry was ready with suitable new products to take full advantage of the situation, and has established itself firmly in the field.

The relative variation in textile and paper sack production in the past few years can not be readily put in the form of a clear picture. Both have had their ups and downs, and the use of other types of shipping containers, such as corrugated and solid fiber boxes and drums, steel barrels and drums, and wire-bound boxes and crates, complicates the picture. Further confusion is added by the fact that many sack manufacturers use burlap, cotton, paper, and plastics in all sorts of combinations, to take advantage of the specific qualities of each. The detailed economic study necessary to draw any firm conclusions is beyond the scope of this evening's discussion.

OTHER CONTAINERS

The prepackaging of foods for the ultimate consumer has provided an ever-increasing outlet for paper bags and other paper containers. Twenty-five years ago, sugar and salt were most commonly packaged in textile bags. Today you usually find them in paper bags and paperboard cartons on the supermarket shelves.

Among new uses for paper are bags with perforations or open-mesh inserts for potatoes and oranges. For

* Presented before the Washington Section on February 9, 1956 as part of a symposium on "New Textile Competitors."

many years these were shipped in textile bags or wooden crates, and re-packaged by the grocer or simply put in the large bag that the shopper carried home, without separate packaging. Now there is a trend toward packaging them once, at the source, using a paper or wide-mesh textile bag. One also sees more pre-packaging of tomatoes and soft fruits, often in paperboard containers with transparent inserts.

For flour bags, paper and textiles seem to be mostly complementary, rather than competitive. Supplies in large units to bakeries and institutional users are generally in textile bags, while smaller units to the home user are more commonly in paper.

An interesting use of packaging paper that has grown rapidly in recent years is the wrapping of the roots of plants and shrubs by nursery gardeners. Creped kraft paper seems to be a favorite, as it has enough flexibility and stretch to fit irregular shapes, offers good protection against external damage, and preserves the moisture content of the roots and surrounding soil. This usage also got a boost from the wartime shortage of burlap, though the latter is apparently still preferred for larger trees and shrubs.

SANITARY PAPERS

The group of papers in this Census classification is another that has shown remarkable growth. The items most competitive with textiles are napkins, towels, and facial tissues. These three have a total annual production in the neighborhood of ¾ million tons.

Facial tissues are used instead of wash cloths for removing make-up, and in place of fabric handkerchiefs, especially for those annoying common colds. They have great versatility as wiping tissues—they remove ink from drawing pens, road grime from auto windshields, and food from baby's face. Easy disposability and elimination of laundering are factors in their favor as compared with textiles. Recent developments that have made them still more attractive are their availability in a variety of pastel tints as well as bright white, and the incorporation of wet-strength resins, so that they will hold a good sneeze, and be strong enough for wet-cleaning. Indications of the growth of this item are given by a rise in value of product from $12 million in 1939 to $50 million in 1947, when 131,000 tons were made, and a rough estimate of 250,000 tons in 1955.

Paper towels form another item that doubled between 1939 and 1947, when 180,000 tons were produced, about one-fourth for home use. Again, the introduction of wet-strength papers, and the development of softer, whiter paper, have increased their popularity. The competition between paper and cloth towels for washrooms in factories and semi-public places is particularly active. The proponents of each can cite advantages for their product, and back them up with data about cost, cleanliness, convenience, and personal preference. Textile and paper towels have another competitor, the electrically actuated hot-air blower, seen in hotel and restaurant washrooms, and in the home especially as a hair-dryer. One must admit that paper towels are not yet ideally suited for the latter purpose.

Paper napkins, the third item in this group, provide an example of growth over a longer period. They first appeared in the statistics as a separate item about 1925, when 12,000 tons were produced. Figures for 1955 have not yet been published, but an estimate of 165,000 tons will not be far from right. Part of the increase has resulted from a broadened range of product: cocktail napkins with printed cartoons and quips, napkins with printed advertising, and large soft multi-thickness dinner napkins. The ample size, soft but substantial texture, and good absorbency of modern paper dinner napkins make them acceptable for use in the home when you have guests for dinner.

Some paper napkins have taken advantage of new fields in roadside stands and soda fountains, where textile products probably wouldn't have been used anyway. At the other end of the scale, custom still dictates the use of linen at banquets and formal dinners. Between these extremes are all degrees of competition.

There are several minor sanitary papers for which separate production figures are not available. They include such items as bath mats, increasingly popular in motels; barbers' neck bands; bibs both for children and for adult devotees of spaghetti and lobster; bathroom guest towels and wash "cloths"; and disposable diapers and liners.

These first two categories, packaging and sanitary papers, are the only ones big enough to warrant separate production statistics. The omission of economic data on the other categories does not mean that they are unimportant; some are important now to their users, makers and competitors, and others will become so in the future. But in a brief summary, some details must be passed over.

FOOD SERVICE PAPERS

This category overlaps sanitary papers to some extent, for napkins and bibs could be considered in either.

Paper table covers are enjoying increasing popularity, though they may remain a comparatively small specialty item. They are liked for outdoor picnics, where one does not wish to expose a more expensive cloth to danger of injury, and for festive occasions like children's birthday parties, for which they can be obtained in gay colors and special designs.

When a complete table covering is not used, one may get paper place mats, doilies, and the like. These are widely used in large chain restaurants as well as in the home. Inter-city chains find them a convenient means for advertising locations in other cities, and the small fry like them to draw pictures on while waiting for service.

Paper tray covers are a convenience for hospitals and institutions, as they can be thrown away after each service, instead of being laundered.

So far as the paper industry as a whole is concerned, a great majority of food service papers are not in competition with textiles, but are paper cups, plates, and utensils in competition with glass, china, plastics, and metal tableware.

HOSPITAL AND MEDICAL PAPERS

The low cost and easy disposability of many paper products make them advantageous for hospital and medical services, since potentially infectious material can be destroyed without laundering. Uses of this sort are being made easier in hospitals by a new device for macerating and sterilizing used papers in the hospital ward, and then flushing it to the sewer. Such devices are found in some Veterans' Administration hospitals.

A recent interesting development is an envelope in which surgical instruments can be placed for steam sterilization and kept sealed until ready for use. These are made of wet-strength paper, very permeable to steam, but not to small solid particles like airborne dust. A white band along the envelope turns black on exposure to live steam for a few minutes, thus providing an extra check on the efficiency of the sterilization.

Paper surgical rolls are used for covering examination and operating tables. Paper bed pads find considerable use, especially when frequent

changes of the bedding are necessary. Special paper coverings are sometimes used for temporary wound dressings. And most of us have worn paper bibs in the dentist's chair.

CLOTHING

Though the use of paper for clothing is not large today in proportion to the total amount of paper made, this category gives promise of appreciable development in the future.

One present use is paper aprons, especially for one-time service when factors of sanitation, cost of laundering, or novelty are involved. Hospitals and institutions may use them to minimize the spread of contamination, and the amateur chef who presides over the back-yard barbecue may use them to help amuse his guests as well as to protect his clothing. Machine-creped or plasticized wet-strength paper is used for aprons. Small quantities of paper also go into caps for workers in food industries, novelty hats for New Year's Eve and other parties, eye shades sold to spectators at sporting events, and the like. One also finds paper, or more specifically, fiber board, in shoes as heel lifts, counters, and toe caps.

You may have seen recent news presentations about dresses, swim suits, and rain capes made from paper. These are not yet commercial items, and one may suspect that the publicity is rather a dramatization of the properties of wet strength paper than an effort to sell a new product. Yet we cannot fail to take seriously the possibility of these paper garments becoming important in future years. The photographs show two of these uses.

Inexpensive paper dresses might facetiously be considered a boon to ladies in the entertainment and social world who are said never to be seen twice in public appearances in the same dress. It might be supposed that paper is too fragile for a dress to last for more than one evening, but the true strength of some papers was vividly demonstrated on a TV show two years ago, which showed a professional boxer literally unable to punch his way out of a huge paper bag.

A wet-strength paper with suitable impregnation and water-resistant coating will apparently serve quite acceptably as a rain cape. Perhaps these will become a convenience in rail, air, and bus terminals for the traveler caught in rainy weather away from home—just put a coin in the slot and get an emergency raincoat.

Paper bathing suits seem to be well within the realm of possibility, as shown by the kids in the photograph.

Figure 1

Hat and skirt are made of a paper fabric that can be spot cleaned, dry cleaned, and pressed. It contains melamine-formaldehyde wet-strength resin. (Photo from American Cyanamid Co)

They might be particularly desirable for the bath houses at our popular beaches and for swimming pools, which rent suits to visitors for one wearing. The cost of a new paper swim suit might well be competitive with the costs of handling and laundering a fabric suit plus the costs of depreciation and replacing losses. The fact that the paper garment could come to the user in a new package, untouched by any other wearer, would have a psychological advantage. It may be some time, however, before the public can be persuaded that a paper swim suit is socially safe.

Figure 2

Paper bathing suits made experimentally are worn by children in a backyard pool. The paper contains melamine-formaldehyde wet-strength resin to increase wet and dry strength and other properties. (Photo from American Cyanamid Co)

INDUSTRIAL AND MISCELLANEOUS

There are many items in this category competing with textiles. Perhaps the largest is paper twine, for its production runs into tens of thousands of tons every year. An important special use of paper twine is the fabrication of automobile seat covers.

A brief listing of typical items will suffice to illustrate other uses. Chair bottoms are mass produced in suitable sizes from paperboard instead of cloth, and can be rapidly stapled into place. Painters' "drop cloths" made of paper are especially cheap and handy for the do-it-yourself fan. There are several kinds of wiping tissues: blue windshield tissues are becoming a familiar sight in gasoline service stations; industrial wiping tissues are replacing old rags in laboratories and shops; and oil-treated lintless tissues are used for dusting furniture. Large amounts of paper are used as a base material for simulated leather, as a laminant with organic plastics, and as the base for adhesive tape.

BASIC FACTORS FAVORABLE TO GROWTH OF PAPER INDUSTRY

The rate of paper production has more than doubled in the United States between 1939 and 1955—from less than 14 million tons in the former year to nearly 30 million in the latter. Economists predict continued rapid growth. The textile industry may expect ever stronger competition from paper, and it might be well to take a quick look at some of the factors favorable to the growth of the paper industry.

Most obvious is the low cost of paper. Increased prices of newsprint have caused quite a furor, yet most newsprint is still sold for less than 7 cents a pound. Shipping sack paper, an important competitor of textiles, is quoted at less than 9 cents a pound. Even standard book papers cost only from 12 to 17 cents a pound. You may compare figures like these with the prices of raw materials and finished fabrics in which you are interested.

Costs have been kept low in the paper industry partly by great increases in the productive capacity of mills. Paper machines have doubled in width and speed in recent years. It is commonplace for new machines to turn out a web of paper nearly as wide as a street, and moving at the speed of an automobile. Paper production

(concluded on page P483)

AATCC Research Committee Report———

PROGRESS REPORT
Subcommittee on Suntesting—Committee on Colorfastness to Light

C H A SCHMITT, *Subcommittee Chairman*

TESTS for determining colorfastness to light by exposing dyed samples to sunlight do not have the extensive historical background in the United States that they do in the rest of the world. Carbon-arc devices have been the backbone for obtaining fastness to light in the United States and the results have been reasonably satisfactory in spite of the well-known limitations.

For many years the activities of the AATCC Committee on Lightfastness have been almost entirely directed toward improving the test method by studying certain variables relative to evaluating colorfastness to light by the carbon-arc procedure. Considerable improvement in the reproducibility of the test has resulted even though some Fade-Ometers are carelessly operated without attention to the frequent calibration necessary. The intent of this report is to acquaint members of the AATCC with the work in progress and to give some of the conclusions already apparent. A comprehensive technical report including data leading to these tentative conclusions will be published in the fall of 1956.

To give a better understanding of the subject, the Committee frequently uses the terms "Daylight" and "Sun" to distinguish two basically different test procedures. In a "Daylight" test, the test specimens are continually exposed from dawn to dusk and are left in the test cabinet overnight. This method is exclusively used outside the United States. The present AATCC procedure calls for a "Sun" test (exposure between 9:00 am and 3:00 pm on sunny days), which is a technique selected many years ago and believed to be a more accurate and duplicative test than the "Daylight" method. However, the "Sun" test is less convenient and rather impractical in localities where ample, clear sunshine does not prevail.

The inconvenient nature of the AATCC Sun Test and the tendency of the US textile industry to discuss colorfastness to light in terms of hours rather than ratings based on the AATCC blue standards has led to the adoption of nonstandard suntest procedures by some commercial testing companies and consumers. One procedure has been to use a daylight procedure with simultaneous exposure of blue standards, which has not given any serious complications. Another nonstandard procedure caused many misunderstandings and resulted in the chairman of the Technical Committee on Research assigning the Lightfastness Committee to investigate and ascertain the fitness of the procedure for evaluating lightfastness. A subcommittee has conducted an extensive series of tests on the matter for 18 months by exposing many dyed textiles in Miami, Phoenix, and Chicago. Even though tests are continuing, the current interest in the general nature of the findings to date has prompted this preliminary report.

The test method which prompted the investigation involves exposing the specimens without blue standards by a 24-hour daylight procedure, but only crediting time for those periods when the solar intensity exceeds 0.823 gram calories per square centimeter. Three questionable points are immediately obvious to those skilled in the finer points of suntesting:

1) The rating is based on hours of exposure without any calibration from blue standards simultaneously exposed.
2) The assumption is made that no significant fading occurs below 0.823 gram calories per square centimeter, the so-called "erythemal limit" below which sun burn of the skin is not likely to occur.
3) The assumption is made that the rate of fading does not vary appreciably at different intensities above 0.823 gram.

The data in the Committee's hands clearly indicate that Point No. 2 above is based on a totally false assumption, ie, significant fading does not occur below 0.823 gram calories per sq cm. This point alone explains why the procedure in question has led to erratic results, incorrect judging of colorfastness, misconceptions as to the severity of fading in Florida as compared with other localities in the United States, and misconceptions as to the relationships between sun fastness and Fade-Ometer fastness on specific specimens. Radically different degrees of fading are obtained by this procedure, for the same number of credited hours of exposure especially when the weather is predominantly clear or cloudy, being understandably more severe in intermittent cloudy weather when a fair part of the total radiation received is often just below 0.823 gram calorie per sq cm.

Regarding Points Nos. 2 and 3 above, the Atlas Electric Devices Company cooperated with the Committee by setting up four test frames equipped with shutters opened automatically at a desired level of sun intensity and closing at a desired higher level. Instrumentation automatically recorded the langleys received at each level of intensity. Results indicated that fading occurs at all levels, increasing nonlinearly with intensity. Tests were made at fours levels:

0.1 to 0.823 gram calories per sq cm
0.823 to 1.0 gram calories per sq cm
1.0 to 1.2 gram calories per sq cm
1.2 and above gram calories per sq cm

The results to date have encouraged the Committee to investigate the possibility that a completely new test procedure can be developed based on a degree of exposure in terms of langleys.

A langley unit is on gram calory per square centimeter. Thus, it is a product of solar intensity and time, ie, a quantity of radiation determined

by pyrheliometers and suitable recording and integrating apparatus. At the present time all commercial test stations have the necessary instruments so no new equipment will be necessary. However, coupled with a daylight procedure, the test would be considerably more convenient and results would be obtained in much less time than is now possible with the "sun hour" procedure. The latter point is particularly important in the testing of very fast specimens. When instrumentation is not available and a daylight method is used, present blue standards would be required as the primary standards necessary for calibration and correlation.

Another point should be made for those interested in international standardization of test methods. There is little hope for international unity in sunfastness testing in the foreseeable future as the proposed procedure of the International Organization for Standardization (ISO) is based on a different series of blue standards, a daylight test instead of a sun test, and a different method of evaluation than standard in the United States for many years. Our industry has too large an investment in our methods to change overnight; the same is true for our colleagues abroad. Accordingly, the Lightfastness Committee plans to establish the correlation between the two basic approaches in order to provide the means for translating ratings of dyes by one system into ratings by the other. This should be most helpful for those studying the literature on dyes and assist chemists and dyers in areas such as South America, where shade cards of both European and American dye manufacturers are used. There is a possibility that a common meeting ground can be established on a Standard Daylight test based on Langleys, but even then it would have to be established that our technique of rating at the first "just appreciable fade" versus that of the ISO judging of the fading past that point would not lead to serious discrepancies.

The special task group that has been carrying out this program consists of:

C H A Schmitt, Sandoz Chemical Works, chairman
E C Atwell, Burlington Mills
Matthew Babey, American Cyanamid Co
Joseph Norton, Atlas Electric Devices Co
Frank Rizzo, Office, Quartermaster Research & Development Command
Charles A Seibert, AATCC research associate
Charles A Sylvester, E I du Pont de Nemours & Co, Inc

Paper Products——

(concluded from page P481)

processes have lent themselves readily to automation, and the next few years will no doubt see rapid development along this line, further increasing productivity.

Supplies of raw material for paper appear to be adequate. The recurrent fears of exhaustion of the pulpwood supply never reach reality. A Government publication 50 years ago bewailed the critical situation caused by using up the spruce forests near our paper mills, and called for the use of corn stalks and wheat straw, at a time when annual production was about 5 percent of what it is now. But the industry has gone farther afield to use Western softwoods, has learned how to use Southern pine, which now furnishes more than half the country's paper pulp, and is now beginning to tap the immense timber resources of Alaska. It has learned how to raise tree crops on a sustained annual yield basis. As the areas of tree farms increase, both in the hands of pulp users and on farm wood-lots, it is quite likely that the supply can be kept in balance with the demand for years to come.

A most important reason for the continued expansion of the paper industry has been the development and engineering of new products and better papers. Improved pulp cooking, bleaching, and finishing processes have all contributed their share. The use of synthetic resins, either incorporated into papers or laminated with them, has opened up many new uses. This is largely a development of the past 20 years, but it is estimated that today more than a million tons of paper annually contain wet-strength resins. Clem W Kohlman, in the *Paper and Twine Journal* of October, 1955, discussed new paper products of all kinds, and it was interesting to note that more than half of the new papers involved synthetic plastics in some form. New products are continually appearing. Paper made entirely of glass fibers has become commercially practicable only since 1952, as a result of research conducted by the Naval Research Laboratory, in which the manufacturers of glass fibers and the National Bureau of Standards participated. Yet in 1956 it is estimated that 1,000 tons of this hitherto "impossible" paper will be made.

IMPORTANCE OF RESEARCH IN A COMPETITIVE FIELD

From these sketchy observations, it seems not unreasonable to conclude that research, product development, and process engineering are highly important in the struggle for an increased share of the market. One need only recall the history of the leather industry, which was among the largest in this country about 1900, but today is far down the list. It is thought, however, that much of this decline might have been overcome through coordinated and expanded programs of research within the industry that would lead to the development by the industry of satisfactory materials other than hides, and to secure technical information that would be useful in bringing about improvements in the performance characteristics of materials already in use.

Many of the changes in the competitive position of different textiles would seem to have resulted from adaptations of new materials to specific uses, with consequent shifts of materials between uses. Cotton, nylon, and acetate have taken many of the places of imported silk and bristles in hosiery, other clothing, and brushes. Nylon has replaced imported fibers in some cordage. New water-resistant treatments have replaced rubberized fabric in raincoats. Paper towels have displaced cloth ones. Fabrics and plastics have taken the place of wood in boat hulls and furniture; a greater proportion of wood goes into paper, and so on in an endless chain.

As our population increases and standards of living rise, great new markets will open up, and the major shares will probably go to the textile and paper companies who have prepared themselves by research and development of new and better products, rather than to those who are merely trying to increase their share of present business only by cutting costs and making minor improvements in their products.

Contribution——

CHEMICAL CONSIDERATIONS OF WOOLEN AND WORSTED FINISHING*

HERBERT C HALLER

Bernhard Altmann International Corp
New York, NY

I INTRODUCTION

THE entire woolen and worsted finishing field has experienced some astounding changes in the last 10-15 years. The introduction of new chemicals and, equally important, the new technical knowledge of the fiber histology gives us more ways of treating than ever before.

No longer is finishing an art such as comes with experience of trial and error. The scene has positively shifted to one of real science. Lord Kelvin comes to mind. He pointed to the strict business of science as being that knowledge which can be reduced to specific mathematical values. As has long been established, chemical compounds, whatever they are, must be comprised of so many atoms to give well-established molecules in absolutely known structures. The newer understanding of resins from their original monomers to the polymers of extremely complex structures is no longer guesswork. Wool too has had its road map pretty well established. Its empirical formula, we know, varies between different wools, but the functional groups are well established. Much supporting evidence established by X-ray measurements gives us an accurate picture of the building blocks of the fiber and how they are positioned to one another. Speakman, Asbury, and others, cast the first revealing light on the arrangement of the side chains and cross-linking mechanism. In our country, Harris and his co-workers showed the acid-combining stoichiometry of wool, and disclosed the site positions where dye combines with the wool fiber. A small part of the considerable, laudible work at Textile Research Institute under Dillon and Wakelin has extended the knowledge of wool into terms of ortho and para cortex. In Sweden, Gralen and Linberg have revealed new and pertinent information about the various cuticular layers. Throughout the world, research continues to unveil new and useful physical and chemical facts concerning Nature's wonder fiber—wool. As a famous comedian says—"Everyone wants to get inta de act!", but in this type of act we can't have too many good performers. So, wool science is a reality.

It follows that the tremendous amount of work done in application laboratories was, in a large measure, based on the precise knowledge of their own products, coupled with the newer fiber findings. All this is bearing fruit. Today, the finisher has at his command a large number of end effects, which he can achieve through working closely with the chemist and physicist to arrive at a precise method of application of intelligently selected materials. Specific conditions are met in terms of concentrations, times, temperatures, and pressures, and knowledge of the conditions of the materials to be treated. Now it is time for us to move into the specific areas.

II SHRINK RESISTANCE TO WASHING

As often stated, the valuable property of wool fiber, namely its ability to felt, also can offer a lot of trouble. When it occurs at a time that it is not wanted, it may result in Dad turning over a $3.50 pair of argyles to Junior, whose footsize is represented by the formula $S = D/2$, or exactly one-half that of Dad's. The same mathematics extended into the field of sweaters, shirts, and other articles to be washed may mean trouble and disappointment to the first owner, when performance is poor. We know, for instance, that when a sock has shrunk to a point 13% under its initial size, the owner finds discomfort in wearing it. Again 13 proves to be an unlucky number.

The importance of staving off shrinkage of wool materials has long been appreciated on the Continent. Theirs is a demand born out of economy and the difficulty of the replacement of the clothing. In the USA where quiz programs pay off to the tune of anything from $1.00 to $64,000, we have not been so concerned about replacement of such apparel. It is likely that Uncle Sam brought about a recognition of the value of extending the washable life of garments, etc. The vast usage of clothing in the armed services spells tremendous economies for the taxpayer if clothing can be worn out rather than washed out. Perhaps now John Q Public, having experienced these things in the services, wants them in his own scheme of things. Also, the newer fibers which can withstand pool orgies has made wool producers develop a desire to stay in the swim.

The literature is overflowing with methods for making wool shrink-resistant. Following Moncrieff's (*1*) general outline, the most outstanding methods can be further simplified as shown in Table I.

Table I is really a boiled-down version of some of the available methods, for there are many more than appear. The mention of any particular method does not constitute an endorsement. All have their own particular advantages, as well as some disadvantages.

It is interesting to note that chlorination of wool was first carried out for the purpose of altering the dye take up by the fiber. That was some 115 years ago, and only sixty years ago was the shrink-proofing quality recognized (*2*). Today, chlorination is far more important for imparting shrink-resistant properties than for the altering of dyeing properties. It is well known that the chlorination of wool fibers is always accompanied by some damage to the fiber. The relatively recent advances in control of the processes have resulted in good shrinkage control with rather low damage.

* Presented on October 17, 1955, before the 4th Session of the Course "The Finishing of Textiles", which was given at the Philadelphia Textile Institute under the sponsorship of the Educational Committee of the Philadelphia Section.

TABLE I
Some Shrink-Resist Methods

GENERAL CLASS				
	Wet chlorination comps—NaOCl, HOCl, $CaOCl_2$			
	Wet Cl_2 Gas			
	Dry " "			
	Wet Chloramines / Chloramides RNH_2Cl			
Harriset, Schollerize, Kelpie, Negafel, Protonize, Sanforlan, other halogens: Fl_2, Br_2, I_2.				
Dry solvent:	Sulfyryl Chloride SO_2Cl_2		Nitrosyl NOCl	Potash Alcoholic KOH
Enzymes:	Papain Neutral & bisulfite	Pepsin HCl	Pancreaton Na_2CO_3	Trypsin & Electrolyte pH 8.5 – 10.0
Cross linking:	Aldehydes HCHO	Mercuric acetate CH_3COOH_g		Benzoquinone $C_6H_4O_2$
Resins:	Melamines—nylon film—acetate film—methacrylate rubbers, natural & synthetic—vinyl—silicones—urethanes			
Producers:	American Cyanamid, Monsanto, Rohm & Haas, Dow, GE, US Rubber, Naugatuck			
Mechanical:	Fuller's Earth, carborundum, silica, alumina			

We will now consider a few of the better-known methods. Some of these were reported by Weiner & Rizzo (*3*) in a study undertaken by the US Quartermaster Laboratories.

HARRISET———This involves a continuous process, which, for the most part, has been for application to tops. The source of chlorine is from a hypochlorite. Since the process is continuous, and involves an extremely short time, it is most carefully controlled. Instrumentation to govern pH, available chlorine, and temperature is a must. The reaction of the wool and chlorine takes place in a matter of seconds. The wool is wetted in the chlorine bath containing an efficient wetting agent. After being squeezed, the wool is passed through a dilute solution of sodium bisulfite, which brings to an end the reaction of wool and chlorine, commonly referred to as an antichlor. Rinsing follows, and the top is then dried in the conventional manner.

SCHOLLERIZE———This, for the most part, has been a batch process used on piece goods. Calcium hypochlorite is used. Acidification of the goods is brought about in the presence of a buffer. The hypochlorite is then added, and the cloth is run for five minutes. This process too makes use of an antichlor followed by a rinse.

KELPIE———This is another rapid, continuous method using relatively high concentrations of free chlorine with some hypochlorite present. The method relies on acidification with H_2SO_4. Usually, a 30-second immersion is used, and this is followed with an antichlor, rinsing, and softening.

NEGAFIL———This process is rather highly regarded on the Continent. It uses a hypochlorite at low temperature (approximately 10° C) and formic acid to a pH of about 4.0. After the goods are entered, the lot is run for 5-10 minutes during which the pH is kept at 3.5-4.0 with further additions of acid. Antichlor treatment follows and then rinsing. Since the wool is processed at its iso-electric point, the damage is claimed to be at a minimum.

PROTONIZE———So far as is known about this method, it is based on treating wool with an acidified solution of chlorsulfamate. Sulfuric acid is used and the release of chlorine is purposely slowed down in order to extend the time 15-20 minutes. For more rapid results, the temperature may be raised to 100°-120° F. It is a batch process.

SANFORLAN——— An alkaline medium is resorted to in this batch process. Potassium permanganate is also employed in the method. A pH of approximately 8.5 aids in slowing down the rate of chlorination. Calcium chloride is also added to the batch, which gives impetus to the reaction. As in the previous processes, an antichlor is used.

While there is variation among the aforementioned methods, they all rely on attrition of the fiber cuticle.

GAS———Chlorine gas has long been employed, but its success has not been outstanding when one considers its limited adoption. Of the two charted, the use of dry chlorine gas has been more often used than the gas-in-water medium. Perhaps the outstanding gaseous application has been the Woolindras process under the WIRA patents (*1*).

In this process, dry chlorine gas is metered into a previously evacuated chamber, which may hold stock, top, yarn, or garments. The material to be treated is first conditioned to contain approximately 8.5% moisture. It takes approximately 30 minutes to feed the gas into the chamber during which the vacuum is altered. There is a temperature rise, and free HCl is formed on the fiber. The chlorine is then blown out of the chamber into towers where it is washed and absorbed. The acid in the wool is neutralized in another piece of equipment after its removal from the chamber.

In all cases, it has been found to be more favorable to the wool to carry out chlorination after dyeing. Therefore, dyes which will withstand the process must be employed.

One attempt to continuously chlorinate top with gas met with success laboratorywise. It consists of a special glass chamber with inlet and outlet valves. The top is drawn through the chamber by rollers at the outlet end. A slight twist in the top gives the material sufficient strength to avoid breakage. The gas is metered into the chamber at a given rate through the use of a flow meter.

OTHER HALOGENS———Bromination and the use of iodine and fluorine have met with limited success. Chlorine gas from the reactions is dangerous enough if allowed to get out of control, but the other halogens can be more dangerous. The economics and additional difficulties in handling these products are the first reasons for their lack of development. Some bromine is still marketed for such use, but little is heard of it today.

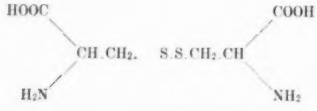
ORGANIC SOLVENTS METHODS ———Much work has been done employing organic solvents for such compounds as SO_2, Cl_2, $CrCl_3$, $SiCl_4$, ClO_2, and KOH in alcohol. The first four usually employ white spirits or carbon tetrachloride, or some other suitable solvent. None of these ever gained favor in this country, and proved to be not sufficiently economical for wide development elsewhere.

ENZYMES———It has long been known that proteolytic enzymes can alter the surface structure of wool, thereby reducing the felting properties of the fiber. This action on wool can be brought about slowly. In fact, wool protein is less susceptible to such action than most other proteins. This

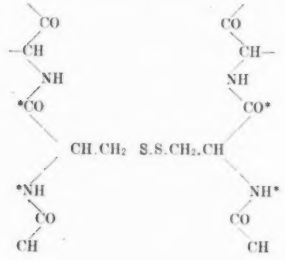
allows for good control of the rate of action. Various compounds can be used (*1*) to accelerate the action, such as sodium bisulfite with papain, or hydrochloric acid with pepsin, while pancreaton is made more active with mercuric carbonate. Other variations can be employed, such as peroxide bleaching with a papain treatment later. None of these have yet made successful bids for wide use.

CROSS LINKING———The disulfide linkage in the cross members connecting the side chains of the wool molecule are most easily attacked by reducing agents.

When such damage occurs the way is opened for repair in a number of ways. The classical structure is shown as:



This is often referred to as the diamino diacid. They become integral parts of two polypeptide chains.



The atoms falling between the asterisks are those which appear in the original cystine molecule. When we speak of "disulfide linkage", "cystine linkage", or "covalent cross linkage", the terms are synonymous (*1*). Some of the known compounds which serve in cross linking are:

aldehydes
mercuric acetate
benzoquinone
metallic salts
methyl halides

Reactions with these compounds rebuild broken linkages and serve to recover fiber strength and, at the same time, impart some resistance to felting action. Perhaps aldehydes and the methyl halides serve best of the compounds investigated to date. For actual use as felting preventatives they have not reached popularity.

RESINS———In considering this field of activity for developing shrink-resistant wools, we are dealing with a relatively new one. It is also a very wide field, one which offers variation in basic principles as well as types of materials. There is no doubt that the advances in the last few years have closed some fairly wide gaps which previously existed. In the AATCC Year Book more than 120 resins are listed, which serves to show the increase gain in importance of these products.

The early work in using resins on wool left much to be desired. Invariably, the soft natural hand of the wool was impaired. In some cases the goods yellowed and others developed odors. Often, the tensile strengths of the fabrics were lowered. Almost always the application of the earlier products requited a high baking temperature to properly polymerize the resins.

While the number of resinous materials tried on wool is large, the actual choice is rather limited for material type. There are two main types; thermosetting and thermoplastic. Usually, the thermoplastics are polymerized, and are from rubbery to rather hard materials. These so far have not found wide use. The thermosetting types have gained wider use, and today can be applied with regular equipment found in the average mill.

It should be understood that application of shrinkproofing materials of these types must be made after the wet-finishing treatments. Since no sizeable shrinkage takes place after treatment, operations such as fulling would be nullified. Then the deposition of resins outside and, in some cases, in the fiber interior serve to act as a dye resist, which dictates the need for having goods dyed before resin application.

LANASET PROCESS———The chemical basis for this material is the dicyanamide, which, when converted to melamine, is further reacted with formaldehyde to give methylolmelamines. On heating, these resins are polymerized. However, the poor solubility in water limits their use. The methyl ethers were made, which overcame the drawbacks of the less soluble products.

The clean fabric, free from oils and fats is padded with a water solution of the resin containing 10-15% resin, and approximately 0.5% of an acid catalyst. The goods are then squeezed and dried. A new approach is claimed to be more satisfactory, if the wool is first given a light bleach. This prepares the fiber to better receive the resin, and lower temperatures are used in the final drying. Other methods of fiber preparation, such as alcoholic caustic treatment, are suggested.

RESLOOM———The same general situation applies here as with the Lanasets. It too is a melamine-formaldehyde product. It might safely be said that these resins are the foremost type used in this country for treating wool. Chlorination enjoys wide usage, but the resins are becoming more important yearly.

First claims were that the resins were distributed uniformly throughout the fibers, but Royer & Maresh (*4*) were able to show by phase microscopy that the resin is deposited on the fiber surface. Not only does this alter the surface characteristics of the fibers, but where fibers cross each other a "spot welding" of fibers takes place. While this effect is not too desirable in some constructions, it serves very well in others. This is the case of soft zephyr yarns in knitwear, as compared to more highly twisted yarns in woven goods.

SILICONES———There is no doubt that this class of resins is rearing up as an important challenger in the fight for top honors. The silicones are built of alternating oxygen and silicon atoms, and the unsaturated valences of the silicon can take up organic groups.

These products have a wide variation in composition, all the way from gaseous compounds to elastomers, or rubberlike materials. Due to their high heat and oxidation resistance, they perform well where other substances fall down. The class most broadly examined for textile use are the methylsiloxane polymers.

It is interesting to note, according to Glaser (*5*), that Dumas, in England in 1840, suggested the possibility of organo-silicone compounds. Twenty-eight years later Fadenberg and Freidel made tetrachlorosilane. Since then, many derivatives have been prepared. It is in recent years that textile applications began to prove of distinct interest. Fortess, in the same issue, gives an excellent review of silicone resins in textiles. While claims are made for their effect in stabilizing wool to shrinkage of washing, we must observe results of the treatment more carefully over long range. Some interesting data are given by Dennett (*6*) in an article describing applications and test results.

The remaining products listed on the chart, but not discussed separately, have been studied, and have not at this time shown to be outstanding for shrink resisting of wool. The rubber emulsions have been offered commercially, but have not yet become important in the field. Storage

has been a problem in this type of product. Goods treated with the rubbers developed objectionable odors and dryness.

Insofar as the mechanical abrasion methods are concerned, we might as well say, "They have been interesting." Not only do they wear scale surfaces down to make the fibers shrink resistant, but they also wear down machines creating a bad "shrinkage" in this area.

III MOTHPROOFING

The winging moth moving about in the home strikes fear into the bravest housewife's heart. She can visualize the new suit, which she had to drag hubby downtown to buy, as a network of ventilated spots. The average housewife knows now that the flying moth is not the culprit which does the actual damage. It is her offspring —the larvae which is the hungry child. Actually, while the housewife has her headaches in this way, others have a king-size pain in the same way. Consider the mill which stores tons of raw wools and specialty fine fibers. Here is a sizable problem, but even more important is the one of keeping cloth, either stored or in transit, from being damaged. Think too, of the vast storage problem which Uncle Sam faces with the millions of yards of piece goods handled through the Quartermaster depots. The lowly worm of the moth is reputed to have cost the nation some $100,000,000 annually (7). Actually, the total damage is creditable in part to other insects too, such as the black carpet beetle, silver fish, even the cheery crickets, and any of the 36 other culprits listed by Ott (8).

However, given a keratinous fiber—unprotected—it is doubtful whether the insects at which an accusing finger is pointed care much if the fiber is part of a suit, sweater, socks, rugs, or upholstery. To the culprit it merely is part of its three squares a day, or any multiple thereof.

In protecting keratinous fibers from damage, temporary and permanent types of chemicals are used.

TEMPORARY TYPES———Considering the first, we find a variety of sprays and vaporizing chemicals. Some are more permanent than others, but most used in storage conditions are likely to be temporary. We need not concern ourselves with these, since they do not come into the scheme of finishing. Ours is the problem of applying deterrents to the cloth or fibers which find their way into fabrics.

We do find, however, some temporary protection imparted to piece goods. Usually, the products used are fluorine derivatives. One class is of the organic fluoride family (7), and another is of the inorganics. While there is good protection if these products are used correctly, the washing of garments and even drycleaning, particularly when water-soluble soap is employed, reduces the protection almost completely. Either family of fluorides is applied in the final 15-20 minutes of the last wet-finish operation.

Of the better known types is a sodium silico fluoride (2). This product is used in a wetting-out bath, and if 0.2% fluorine can be deposited on the weight of the fiber, the desired protection may be had. Other salts, such as sodium, potassium, zinc, and cobalt fluorides, have been used. Another satisfactory material is potassium bifluoride. It must be kept in mind that these products have no fastness to washing.

PERMANENT TYPES———Of the permanent agents, all have good fastness to wet- or drycleaning. In all cases, the substances are, in effect, colorless dyestuffs. They are substantive to the animal fibers, and can be introduced nicely into the dyebath. This makes application possible in normal mill processing. While exhaustion is best at the boil, certain brands can also be exhausted at temperatures of 130°-160° F with the addition of acetic or formic acid. One such agent is a pentachloro-dihydroxy-triphenyl methane sulfonic acid, while another is said to be 4-tri methyl ammonium laurophenone methyl sulfate (2). With the above products, 2½-3% is used on the weight of goods to be treated. In the dyebath, no different procedure is needed. If used without dyeing, the compounds will exhaust at 160° F in 20 minutes with 2% formic acid.

A feature of these proofing agents is that good white retention can be expected when they are applied to undyed fibers. While DDT has been satisfactorily used for goods to be stored, it fell down completely against garment cleaning. It can be used for protection up to six months for stored goods. The Quartermaster Depot has developed a method for applying DDT to piece goods. The DDT can be emulsified (9) and sprayed, or employed in a pad operation. A relatively new offering on the market, combines a moth-resisting agent with a silicone resin, and is said to have good permanency.

Chemical alteration of the wool fiber has resulted in permanent mothproofing. Harris, Kobayashi, and Geiger prepared such fibers by reducing the wool cross linkages with thioglycollic acid, then recross linking with methyl halides (10). While the method worked satisfactorily, it has not developed to commercial significance.

IV SHOWER AND CREASE RESISTANCE

These two treatments for woolen and worsted fabrics are closely related, and it seems right to treat them together.

The American public is, on the average, very cognizant of smooth appearance in garments. Any one of us feels better and has an air of confidence when we realize that we are wearing a suit or garments which are trim and wrinkle-free. It is amazing that the feeling fits whether the article is a $150 item or $40!

During the early years of the cottons and synthetics being introduced into suitings, it was standard equipment to get a bag of wrinkles with each garment. Distort or wrinkle a garment and one wound up with a spirit of defeat. During those earlier days of suits made from the synthetics and vegetable fibers, wool was king for neatness. This was particularly true of the fine worsteds which held a press—it seemed, forever. If the suit wrinkled during wearing or packing into a traveling bag, the remedy was simple. Only hang the garment up properly, and usually—presto!—overnight the wrinkles disappeared! There was one drawback. Let a person get caught in the rain, or "accidentally" get splashed by a grinning, passing motorist, and hanging would not be good enough for the suit or the motorist.

Man, being what he is, is never quite satisfied with his lot. With the introduction of resins to textiles, some things were bound to happen. It was soon found that certain resins imparted "bounce or comeback" to crushed fabrics. This was particularly true of the fibers which lent themselves to easy deformation without recovery. So, fabrics other than wool were finding considerably more and more use in crushproof and essentially wrinkle-free garments. Some stunts, such as taking a swim before the next dance, became both humorous and semipractical. Some of the newer synthetics could even fill the bill without treatment. We see on TV that there is now a "disciplined" garment. Too

bad people can't be made so indestructible when run over by a road roller!

Wool, then, if given the property to ward off water or withstand wetting without crease loss, could be made more interesting from the standpoint of the wearer. The animal fibers inherently have some resistance to wetting, particularly when found in a fleece fabric or face-finished fabrics. However, this could be, and is now, improved upon. In all cases, we are concerned with attaining proofing or resistance too, without sacrificing air passage through the fabric.

OILS———The earliest attempts at so-called waterproofing were with drying oils which, when air dried on fibers, gave a water-resistant covering. Because of the development of a sticky hand and some boardiness, these lost ground. Objectionable odors were also part of the negative values in the oxidized oil methods.

INSOLUBLE SOAPS———The insoluble metallic soaps soon followed and enjoyed a fairly wide adoption. Usually this involved a two-bath method in which a soluble soap of higher titer fatty acids was dissolved in water, and the goods worked in this soap bath until thoroughly wetted out. The goods were then extracted or squeezed to remove the excess soap. This was followed by passing the pieces into a bath containing soluble metallic salts of aluminum, calcium, barium, boron, and others. The formation of the insoluble metallic soaps took place on the fiber, and when this was then dried onto the fiber, it provided a water-resistant shield. Apparently, the method was favored by the British for use on servicemen's coats.

Solutions of metallic soaps in organic solvents also was a popular approach to the problem. When not used to excess, relatively good hand was obtainable.

WAXES———Wax emulsions have been employed possibly to a greater extent than any other material to date. The waxes, generally of micro crystalline grade paraffin, are prepared as stable emulsions, usually with aluminum salts present. The highly effective emulsified particles of well under 0.5 micron size can be very evenly distributed with acetic acid effecting the exhaustion of the wax emulsion onto the fibers.

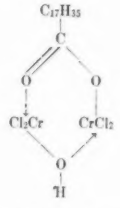
Subsequent drying melts the wax enabling some flow on the fiber and additional evening of the distribution. While certain claims were at one time made as to the fastness to drycleaning, this remains controversial. If some fastness is experienced, it might be due to the solvent redistributing some of the wax after having dissolved it from the fiber initially.

SILICONES———Here the silicones return for an encore. Without question, they have found a niche they will occupy efficiently. Tests indicate that they are fast both to dry- and wetcleaning. Along with the water resistance are spot resistance, improved wear (abrasion), and increased strength. While there are only a few firms producing silicones, they are selling to some nine listed companies, who offer their own particular "know how" in compounding.

The usual approach in application is to prepare an emulsion of about three gallons of silicone "as received" to the 46-47 gallons of water. About a gallon of catalyst is added to the mix, and the preparation then fed into a pad. The goods are run through open width. After saturation, a squeezing leaves about 60% in the goods—based on fabric weight. The pieces are then run into a dryer, which is at approximately 250° F. The time of drying will vary with the particular equipment, but in any case the drying must be complete. Unless this is attained, the resin will not be properly polymerized. No further processing is necessary.

QUILON———While this product is being featured as a material with which suede leather can be made water repellant as well as spot resistant, it may have a place in treating wool.

The compound is a complex of stearic acid and chromium, and is shown structurally as:



Apparently, the chromium reacts with the surface of the fibers, and the stearate group orients outward. This is the type of result one sees when stearic acid is melted, then poured onto cold water. Here too, is orientation which shows the underside to be wet, while the upper surface is completely water repellent.

This product can be used on many types of material, and is usually in water media. It is soluble, and during application, the treating solution must be raised to 200 F. There is apparently some chance of flammability at the higher temperatures, because of the liberation of some isopropanol. This should be interesting material for further investigation.

V SOFTENING

Here is a subject which today seems to be somewhat on the "topsy" side. It sure has "growed." Actually, it has become topsy-turvey.

If you will look over the listings in the *AATCC Year Book*, you will note that there are some 300 softeners listed, and that they cover quite a variety of chemical types. From a study of these listings, we can establish something of the various groupings (Table II). In some cases, a number appears after the chemical, which designates the number of times it appeared. Some products were merely mentioned by name, but not chemically typed, these have not been noted. A few of the items seem to be similar, but there would be some small technical difference.

There are many reasons for using softeners. According to Marsh (*1*), all fibers occuring in nature have some oily, fatty, or waxy substance on them. While silk is harsh when it

TABLE II
Types of Softeners Listed in the AATCC Year Book

Chemical family	*No. listed*
Acetyl ethanolamine	1
Amine wax emulsion	1
Mineral oil with sulfonated oils & esters	1
Fatty carbamide	11
Emulsion of wax & stearic acid	1
Heterocyclic amine	1
Trialkylbenzyl ammonium chloride	2
Amine fatty condensate	21
Fatty esters & amino condensates	5
Highly sulfonated vegetable oils	38
Highly sulfonated vegetable oils	3
Tallow—coconut oil soap	2
Solubilized wax-stearates	1
Long-chain alcohol sulfate	11
Alkylamine	4
Fatty amine	12
Fatty amide	19
Hydroxyethyl glyoxolidine	1
Quarternary ammonium derivative	6
Stearic acid	3
Emulsified oil	4
Nonionic polyoxyethylene derivative	3
Alkyl sulfonate	1
Sulfonated fatty alcohol	3
Fatty acid ester sulfate	7
Wax dispersion	4
Emulsified parafin	1
N-soya-N-ethyl morpholinium ethosulfate	1
Polyoxyethelene fatty acid	2
Polyoxyethelene sorbital fatty acid	1
Fatty acid ester of diethylene glycol	3
Fatty amino amide	2
Sulfated glyceride	2
High-molecular-weight amine acetate	2
Fatty acid amide pyridinium	1
Amine hydroacetate	2
Amino glycol	1
Fatty esters	2

contains its natural gum and sericin, all other fibers are softer with the natural lubricants on them. So, while we clean a fiber by scouring and bleaching, at the same time we contribute toward a harshening effect.

We have already stated that wool, when chlorinated, takes on a characteristic harshness or dryness. It must be acknowledged that normal processing of wool takes away, even to a small degree, the natural softness inherent in the fiber. Even when processes are well controlled, there is some slight damage through scouring, dyeing, and wet-finishing operations, such as steaming, and boiling water treatments. Drying operations, too, contribute some adverse effects. While none of these by themselves can be considered too detrimental if properly carried out, the results of a number of them can be cumulative. Bleaching and stripping also take their toll. In some of the fabrics constructed from reworked wools, large benefits are found through softening. Recent sales points for "upgrading" of wool in any construction through softening may have some merit, but they seem to be overplayed. Let's not forget, though, that many superb fabrics of animal fibers are produced without any softeners whatever. Softeners may aid measurably in giving a surface which can be more easily and satisfactorily napped or raised. This is an improvement over some of the older "finishing" oils. Its general application to goods to be napped would be in a last rinse after scouring or dyeing. The introduction of small amounts of a select softener to wool oil emulsion can add extra cohesion to the fibers, and reduce static, thereby gaining some very valuable aids in carding and spinning. Some wool lubricants already are compounded with similar products.

When one looks over the list of chemicals available for softening, one thing stands out strongly. The large majority of them are based on fatty materials. As listed (*1*), they fall into the following groupings:

a) Emulsions
b) Soaps
c) Sulfonated oils
d) Sulfated alcohols
e) Fatty acid condensates
f) Quarternary ammonium Compounds

OILS, FATS, WAXES——The straight oils, fats, and waxes are not being used to any extent today. Emulsions and dispersions of them do find some popularity, but that too is dwindling. The tendency of these materials to turn rancid and yellow on storage is distinctly a minus value. Some listings are seen in the *Year Book*, but they are in minority. Some of the Carbowaxes, which are synthetic water-soluble products, serve quite well as softeners.

SOAPS——The soluble soaps of fatty acids too have fallen into disfavor. Some of the old scourers and finishers still like to leave a residue of soap on the fibers out of raw-wool scouring. Its value is questionable, and certainly so when left in cloth. Perhaps the proponent for retaining soap as a softener is milady, who uses the trick when washing knitwear or gloves.

SULFONATED OILS —— The listing tells us that these are still popular products, because they are water soluble and not subject to hard water precipitation. In addition, they store well and are economical. They quickly replaced the products previously mentioned. The entire fatty acid series has been investigated over the years, and one can find many of the series available commercially. Better manufacturing methods, and higher sulfonation has helped to keep these materials in the race. Actually, claim is made that some of the sulfonated oils lend protection to fibers during dyeing and bleaching. Evidence has been supplied to uphold the claims. What the actual action is has not been clearly determined. An excellent paper on sulfonation and sulfation by Sisley, translated from the French by Wood (*11*), explains the processes in considerable detail. Application can be made directly in dye and bleach bath, or a small amount introduced in the final rinse in wet finishing.

FATTY ALCOHOLS——By hydrogenating fatty acids, it is possible to produce the corresponding alcohol. By examination, one can see the relationship between the stearic acid, sodium stearate, and the alcohol:

Stearic acid	$C_{17}H_{35}COOH$
Sodium stearate	$C_{17}H_{35}COONa$
Stearyl	$C_{18}H_{37}OH$

Soap making is not an intermediate step for the making of the alcohol. It is simply given to round out the comparison.

The fatty alcohols can be sulfated to produce a series of water-soluble compounds which have good detergent properties and serve well as softeners. This class of materials has a substantive property to wool. While removal can be brought about by extraction with solvents, the action is slow. This indicates some tenacity in its attachment to the wool fiber.

CONDENSATION PRODUCTS——These are usually quite efficient in respects other than softeners, being used in some cases as wetting and scouring agents.

The amine condensates are mostly syrupy, slow-flowing liquids. The color varies from pale yellow to deep honey color. There are also many other condensates involving fatty acid esterification with aliphatic sulfonic acids. Those products may be found as pastes.

IONIC AND NONIONIC——If, in water solution, a substance gives predominating positive charges, it is said to be cationic. When the charge is predominant in the negative side, the material is described as anionic. On the other hand, when a substance is neutral in water solution, it is regarded as nonionic. Mosher (*12*) and Katz (*13*) treat this subject with a good degree of completion.

There are proponents of each type, and there are also those who support mixtures of either of the ionics with the nonionic.

Anionic materials often can be precipitated by the action of strong alkalis or acids. Cationic substances are less affected and may, in some cases, withstand strong acid or alkaline conditions. The particular substances being entertained for use must be cataloged in the above respect. The nonionics are often very stable to acids and alkalis, although some may give way to hydrolysis in their presence. We must always be on guard in respect to the pH condition.

Some of the cationic softeners may cause lightfastness reduction, yellowness in goods, or corrosion of equipment. Since they are mostly substantive, and therefore can exhaust rapidly, exhaustion may be uneven. Also, in pad applications, the first part of a piece might pick up considerably more softener than the trailing end. They do, however, afford some fastness to washing because of the substantive properties.

One of the outstanding cationic softeners can be applied to piece goods in a washer or dye kettle. The goods are run for 15-20 minutes at about 110°F, after which they are removed without rinsing, extracted, and then dried to finish the operation. It is a satisfactory method to use also on stock and yarn. From ½ to 1½%

is usually sufficient to obtain the required softness.

Cationic softeners are being offered which can be introduced directly into a scouring bath. The idea of cleaning and softening at one time is a reality.

Regarding the anionic products, these must be applied as a solution to be picked up by the fabric. Since they do not exhaust onto the fiber, the solution strength and percent pickup must be known in order that a sufficient amount is left on the material to effect softening. Such compounds do not offer any resistance to washing, and would have to be replenished in such a case. A product containing both cationic and anionic materials is found in some cases.

Certain nonionics apparently enjoy use as softeners abroad (*1*). These materials enjoy wider use in this country as detergents, wetting, and dyeing assistants. Chemically, they are of the ethylene oxide alkyl phenol condensates. It would seem that the presence of only a small amount on a coat might well mean a drenching for the wearer if he or she were caught in a rain fall.

So, we find a choice of materials to be used for various treatments. As will always be true, some like their porridge hot—others cold, and still some, in the pot nine days old. The particular need, equipment, and result wanted would dictate the type to be chosen.

LITERATURE CITED

(*1*) Mancrieff, R W, "Wool Shrinkage and Its Prevention, National Trade Press Ltd.
(*2*) Marsh, J T, "Introduction to Textile Finishing," 192, 259, 260, 271, 464, 500, 502.
(*3*) Weiner, L & Rizzo, F, "An Educational Order Trial on 10.5-Ounce Shrink-Resistant Wool Flannel Shirting," *Am Dyestuff Reptr* **42**, No. 5, 125 (March 2, 1953).
(*4*) Matlin, N A & Nuessle, A C, "Dimensional Stabilization of Textile Fabrics," *Ind Eng Chem* **47** (Sept, 1955).
(*5*) Glaser, M A, "Silicone in Protective Coatings," *ibid* **46**, No. 11 (1954).
(*6*) Dennett, F L, "Progress of Silicones in the Textile Industry," *Am Dyestuff Reptr* **44**, No. 99 P293 (1955).
(*7*) Von Bergen & Mauersberger, "American Wool Handbook," Textile Book Publishers, Inc.
(*8*) Ott, D J, "Identification of Insect Damage on Wool and Related Animal Fibers," *Am Dyestuff Reptr* **44**, No. 16, 515 (1955).
(*9*) "The Moth proofing of Wool," *Wool Sci Rev* (November, 1949).
(*10*) *J Res NBS* **29**, 381 (1942).
(*11*) Sisley, J P, "Sulphonation-Sulphation," *Am Dyestuff Reptr* **43**, No. 23 (1954).
(*12*) Mosher, M H, "Surface-Active Compounds—Their Use in Textile Operations," *ibid* **35**, No. 7, P168 (April 8, 1946).
(*13*) Katz, J, "Surface-Active Compounds in the Textile Industry," *ibid* **28**, No. 23, P671 (November 13, 1939).

ADDITIONAL REFERENCES

Product Information Bulletin A6454, Grasselli Chemical Dept.
Gilbert, E E & Jones, E P, "Sulphonation & Sulphation," *Ind Eng Chem* **47** (September, 1955).
Von Bergen, W, "Mothproofing of Woolen Goods in Europe," *Textile Research J* (May, 1946).

Future Papers

Manuscripts of the following papers, all of which have been presented before local sections of AATCC, have been submitted to date to the publishers of American Dyestuff Reporter. Subject to the approval of the AATCC Publications Committee, all will appear in the Proceedings in future issues.

Authors and Section Officials are requested to inspect this list, and notify the publishers if there are any omissions.

"Hibulk Acrilan"—S Jack Davis, The Chemstrand Corp

"Arnel Triacetate—Its Properties, Applications and Dyeing Characteristics"—A F Tesi, Celanese Corp of America

"Cotton Finishing"—Hector C Borghetty, Rohm & Haas Co

"Aesthetic Standards in Textile Print Designs"—D D and Leslie Tillett, House of T Fabrics

"Wash and Wear Finishes on Cotton Fabrics"—Hector C Borghetty, Rohm & Haas Co

"Wash and Wear Fabrics"—E W Lawrence and R H Phillips, Cranston Print Works Co

"Current Developments in the Application of Dyestuffs"—L S Thompson, General Dyestuff Co

"Instrumentation—An Integral Part of Dyeing and Finishing" — Walter Ridley, The Foxboro Co

AATCC Calendar

COUNCIL
Sept 12 (New York, N Y); Nov 16; Jan 18, 1957

NATIONAL CONVENTIONS
Sept 13-15, 1956 (Waldorf-Astoria, New York) (as part of the Perkin Centennial, Sept 10-15); Nov 14-16, 1957 (Hotel Statler, Boston); 1958 (Hotel Conrad Hilton, Chicago); 1959 (Sheraton Park and Shoreham Hotels, Washington, D C)

NORTHERN NEW ENGLAND SECTION
Sept 28 (Annual Outing—Wachusett Country Club, West Boylston, Mass); Oct 19 (Science Park, Boston, Mass); Dec 1 (Annual Meeting—Hotel Vendome, Boston)

PHILADELPHIA SECTION
Sept 28 (Abraham Lincoln Hotel, Reading, Pa); Nov 2 (Drake Hotel, Philadelphia, Pa); Dec 7 (Kugler's Restaurant, Philadelphia, Pa)

PIEDMONT SECTION
Oct 6 (Annual Meeting—Hotel Charlotte, N C)

RHODE ISLAND SECTION
Oct 18 (Johnson's Hummocks Grille); Dec 6 (Annual Meeting, Johnson's Hummocks Grille)

SOUTH CENTRAL SECTION
Dec 1 (Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION
Sept 22 (Columbus, Ga); Dec 8 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
Oct 15 (Annual Meeting—Hartford, Conn); Nov 16 (Rapp's Restaurant, Shelton, Conn)

LAPEL BUTTONS AND PINS

For AATCC Members

Buttons **$2.25**
Pins **$2.50**

Send orders to the Secretary:

H C CHAPIN

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS
PO BOX 28, LOWELL, MASSACHUSETTS

Activities of the Local Sections

Spring Dance—Pacific Southwest Section

June 2, 1956

Club Del Mar, Santa Monica, Calif

(Photos courtesy of A H Roberts, Jacques Wolf & Co)

Tom Lee, Geigy; Mr & Mrs Ed Lindquist, Geigy; Mr & Mrs J Schrader, Hess Goldsmith; Mrs Tom Lee

Mrs James Jelinek; Mr & Mrs Wm Campbell, California Hand Prints; Fred Wilhelm, American Aniline; James Jelinek, Modern Dyers; Mrs Fred Wilhelm

Mr & Mrs Robert Fliegel, PSW Section chairman; Mr & Mrs T B Smock, General Dyestuff

Mr & Mrs John Smith, Dye Masters, Inc; Mr & Mrs Fred Ahl, Du Pont; Mr & Mrs Joseph Dela Barre, Sandoz

Mrs Paul Noonan; Mrs Wm Ingham; Paul Noonan, National Dyeing & Finishing; Wm Ingham, National Aniline

Mr & Mrs Lawrence Krieger, Krieger Color & Chemical; Mariette A Cauquelin; Michael Krieger, Krieger Color & Chemical; Marlene Lizzio; Jack Supple, Caro & Upright

Mr & Mrs Robert Anderson, Modern Dyers of Southern California; Clarice Lindsey, UCLA; Mr Wyle; Betty Mac Taggert; Ronnie Huston, Modern Dyers of Southern California; Mr & Mrs Les Schnider

Robert Anderson, Modern Dyers of Southern California, dance chairman; Mrs Fred Ellsworth; Angus H Roberts, Jacques Wolf & Co; Ann Barnes; H Ellsworth, West Coast Carpet Dyers; Mary Thatcher; James Barnes; Laurie Roberts; Frank Thatcher, Modern Dyers of Southern California

Activities of the Local Sections

Philadelphia

THE Educational Committee of the Philadelphia Section has announced plans for a new series of lectures on "Fabric Construction," in cooperation with the Philadelphia Textile Institute.

These talks are planned as basic information to dyers and slanted toward recognition of potential trouble or specific handling required in dyeing.

The lectures will deal with weave formation, fabric structure, basic raw materials, fabric qualities, yarns and yarn numbering, end use of fabrics, potential faults apparent in the greige goods (with emphasis toward dyeing) and potential faults not apparent in greige goods but made noticeable by dyeing.

Applications for registration in this class may be obtained by writing to the Educational Committee, Philadelphia Section, AATCC, PO Box 5025, Philadelphia 11, Pa.

Hudson-Mohawk

As noted earlier in the June 4th issue, the Hudson-Mohawk Section held its annual Ladies Night meeting at Schuyler Meadows Country Club, Albany, NY, on May 18th, with 42 wives and members in attendance.

Featured speaker of the evening was William S Kather, Silicone Div, General Electric Co, who discussed "Silicones in the Home." Mr Kather augmented his paper with short movies and a display of the many types of articles currently in household use based on silicone products.

Officers for the coming year were announced, and William Nelson, Ritter Chemical Co, was awarded the Dr Jack Epelberg Award for meritorious service to the Section. The award was presented to Mr Nelson by Irwin Smith, recipient of the 1954 Award. Mr Nelson is a charter member of the Section and has served as an officer continuously since its inception, first as secretary, later as vice chairman and chairman. The Award is made annually in memory of the late Dr Epelberg, first chairman of the Section.

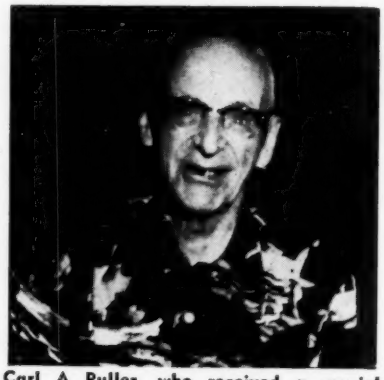
New York

LEROY HAMILTON of Interchemical Corp was the winner in the golf tournament held during the annual outing of the New York Section on June 22nd at the North Jersey Country Club with a low gross of 74. Outing chairman Robert W Brewer of American Aniline Products, Inc, was second with a 77 and Chris W Farrell of Althouse Chemical Co was third with 80. Low gross for guests was won by Louis Monroe, Patex, Inc, with a 76. Low net winners were: members—William Calabrese, Paulden Laboratories, 1st; Robert Stutz, Better Fabrics Testing Bureau, 2nd; Peter Shonk, Interchemical Corp, 3rd; guests—three way tie between Al Rosenberg, Plymouth Dyeing Co; M Schaaf, Ramapo Piece Dye Co; and Al Nicarus, Texstyle Corp. The putting contest was won by Richard Miller of Tennessee Eastman followed by T G Hawley, United Merchants, and William Bartenbach, United Piece Dye Works. Otto J Chido, M Shiller Corp, won the driving contest with 295 yards, and closest to the pin on the 7th hole, 9 feet 2 inches, was Henry Danesi, Supreme Skein Dyeing Co. Winners in the horseshoe pitching contest were Nick Stack, United Wool Piece Dye Works; Joe McKenna, Eureka Printing Co; and John Snoop of Morningstar-Nicol. The Martin Weiner fashion plate award went to Mal Malvin of Cortley Fabrics Co.

John H Hennessey of Berkshire Color & Chemical, retiring chairman, was presented with a donkey, and Donald E Marnon of American Aniline Products, incoming chairman, was presented with a goat. A special award of a clock was made to Carl A Puller, who recently retired from Pfister Chemical Works. Norman A Johnson, retiring as secretary after 15 years, was presented with a movie projector.

Incoming N Y Section chairman Donald E Marnon and friend

This nongolfing foursome includes John H Hennessey, outgoing chairman, and Donald E Marnon, incoming chairman



Carl A Puller, who received a special award of a clock

Norman A Johnson (left), retiring secretary, and Robert W Brewer, outing chairman

LeRoy Hamilton (left), winner of the low gross trophy, is congratulated by Norman A Johnson, editor of American Dyestuff Reporter. Looking on is Chris W Farrell, who turned in third low gross

Photos courtesy of Louis J Dogin, American Aniline Products, Inc.

New York Section Outing

(Photos courtesy of Louis J Dogin, American Aniline Products, Inc)

Perkin Centennial Notes

Those attending the forthcoming Perkin Centennial will want to take advantage of the incomparable facilities of New York, the nation's entertainment capital, and your Entertainment Committee is making every effort to be of service.

Entertainment headquarters and Ladies headquarters will be combined at the Waldorf in Room X, fourth floor, for the entire week of the Centennial. In addition to personnel of both Committees, a representative of the New York Convention and Visitors Bureau will be on hand at all times to meet your needs.

SPECIAL FEATURES—A special program of movies is being scheduled for showings in Room X, and a brochure will be made available giving times, titles, and abstracts of the various presentations. A wide range of subjects will be covered to suit every taste. Some of the titles already scheduled include: "Bright New World," "Roses for America," "Color Rhapsody," "Bermuda Bound," "Figure Forum," "Harvest of the Sea," etc.

Further organized entertainment in addition to a complete Ladies program will include one, and perhaps two theatre parties on Thursday, September 13th. Blocks of 500 tickets have been secured for "The Most Happy Fella" at the Imperial Theatre and "No Time for Sergeants" at the Alvin Theatre.

One of the week's highlights will be the mammoth stage presentation, "Cavalcade of Color—depicting Color in the World Fashion" on Thursday afternoon, September 13, under the sponsorship of Good Housekeeping Institute and the National Retail Dry Goods Association.

RADIO AND TELEVISION—Visits to famous radio and television broadcasts are another of New York's great attractions. A limited number of tickets will be available in Room X on a first-come-first-serve basis. FOR TICKETS TO SPECIFIC SHOWS, YOUR COMMITTEE SUGGESTS YOU WRITE IN ADVANCE DIRECTLY TO THE SPONSOR OR TO THE GUEST RELATIONS OFFICES OF THE VARIOUS NETWORKS: American Broadcasting Company, 39 West 66th Street; Columbia Broadcasting System, 57 East 52nd Street; Dumont Television Network, 205 East 67th Street; Mutual Broadcasting System, 1440 Broadway; National Broadcasting Company, 30 Rockefeller Plaza.

DISCOUNT TICKETS — Discount tickets will be available for many of New York's top attractions: visits to the United Nations, the Empire State Building Observatory, Radio City, Statue of Liberty, Hayden Planetarium, Chinatown, etc.

BASEBALL — The sports-minded will be watching the baseball situation closely in September, and New York's National League entries will be playing host to the western teams. The world champion Brooklyn Dodgers will be playing afternoon games with Cincinnati on Sept 11th and 12th, a night game with St Louis on the 13th, and afternoon games with St Louis on the 14th and 15th. The New York Giants will be playing Milwaukee the night of Sept 11th and the afternoon of the 12th. Games with Chicago are slated for Friday night and Saturday afternoon, the 14th and 15th.

MISCELLANEOUS—Extensive literature and general information will be available at the Entertainment Desk on all current programs in art, music, theatres, exhibitions, etc. Literature will include the 1956 Quarterly Calendar of Events, The Visitors Guide to New York, Visitors Shopping Guide to New York City, and Visitors New York Restaurant Guide.

AATCC members and others connected with the textile industry will be especially interested in "Textiles, USA," a special exhibit at the Museum of Modern Art, 11 West 53rd St.

* * *

THOSE PLANNING TO ATTEND BROADWAY SHOWS, BASEBALL GAMES, THE CINERAMA OFFERING "SEVEN WONDERS OF THE WORLD," THE PRESENTATION "SHOW BOAT" AT JONES BEACH, OR ANY OTHER EVENT REQUIRING ADVANCE SALE OF TICKETS ARE URGED TO MAKE TICKET ARRANGEMENTS IMMEDIATELY WITH BLANCHE FURMAN, 246 WEST 44th STREET, NEW YORK, NY.

HISTORICAL NOTES ON THE WET-PROCESSING INDUSTRY

XII—Callicoes and Indiennes—18th Century Printing

SIDNEY M EDELSTEIN
Dexter Chemical Corporation
New York, N Y

This is the twelfth in a series of historical articles which the textile chemist and colorist will find of interest.

The author, a prominent science historian, is the founder of an outstanding collection of great works, documents and letters in the history of chemistry and related sciences.

Articles and illustrations in this series are from the author's library.

A FRIEND, just returned from a six weeks trip around the world by air, reports that he truly realizes the smallness of the world, and that he can now describe most of the world's great airports and the routes from these airports to the best hotels. My friend could not, and did not, obtain any understanding of the different cultures of the many peoples of the world. Perhaps the "broadening" effect of travel would have been greater if my friend had spent the six weeks in one particular city or in a small area in one particular country.

There are similar approaches in writing about the history of an art or trade. The round-the-world approach is often used and the developments and the people who made them all merge into a continuous blur. The local approach, that is, the examination of a particular period in the history of the art or one particular person's work, will usually give a better understanding and feeling for the past. Also, it's a lot more fun.

Let's take for example, our present project, the history of textile printing. We could discuss printing on all fibers or things could be simplified a bit by picking calico printing only. So calico printing it is. What period do we discuss; printing of cotton fabrics in the times of the Egyptians or in the times of the ancient Hindus? What about cotton printing in Western Europe? Our own closest "printing ancestors" stem from Western Europe, and so calico printing in Western Europe it is. Do we discuss the batik style of printing, the resist styles or the methods which involve printing on the mordants and then dyeing the mordanted fabrics in a dyebath? Since the latter method was the most important in Western Europe, then the mordant method of calico printing it is. Do we discuss roller printing or printing with wooden blocks? Since the history of roller printing is fairly well known and since block printing has rarely been discussed, block printing it is. So finally our history of printing becomes localized into calico printing with wooden blocks, using mordants and the so-called madder style of dyeing mainly in the 18th century in Western Europe and in Great Britain.

Even though we are making just a local stop, we still are entitled to give a brief story of the trip to this stop. The starting point for all histories of textile printing is certain writings of Pliny The Elder, who lived in the first century. In Pliny's Natural History, Book 35, Chapter 11, he says in describing the art of the Egyptians (*1*):

"An extraordinary method of staining cloths is practiced in Egypt. They there take white cloths and apply to them, not colors, but certain drugs which have the power of absorbing or drinking in color; and in the cloths so operated on there is not the smallest appearance of any dye or tincture. These cloths are then put in a cauldron of hot coloring matter and after having remained a short time are withdrawn, all stained and painted in various colors. This is indeed a wonderful process, seeing that there is, in the said cauldron, only one kind of coloring material, yet from it the cloth acquires this and that color, and the boiling liquor itself also changes according to the quality and nature of the dye-absorbing drugs which were at first laid on the white cloth. And these stains or colors, moreover, are so firmly fixed as to be incapable of being removed by washing. If the scalding liquor were composed of various tinctures and colors, it would doubtless have confounded them all in one on the cloths; but here one liquor gives a variety of colors, according to the drugs previously applied. The colors of the cloths thus prepared are always more firm and durable than if the cloths were not dipped into the boiling cauldron."

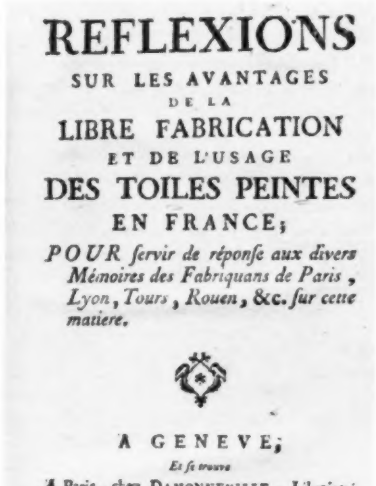

REFLEXIONS
SUR LES AVANTAGES
DE LA
LIBRE FABRICATION
ET DE L'USAGE
DES TOILES PEINTES
EN FRANCE;
POUR servir de réponſe aux divers Mémoires des Fabriquans de Paris, Lyon, Tours, Rouen, &c. ſur cette matiere.
A GENEVE;
Et ſe trouve
A Paris, chez DAMONNEVILLE, Libraire; Quay des Auguſtins.
M. DCC. LVIII.

Figure 1
Title page of an anonymous tract against French restrictions on printed cottons (1758)

As to how the mordants were applied during Pliny's time, whether by block or by painting or by pencil, we do not know. But unquestionably, the results that Pliny mentions could only have been obtained by printing with mordants and then dyeing with a dyestuff such as madder. Madder was well known to the Egyptians at the time of Pliny and there are early Egyptian cloths showing designs in reds and blacks made by a combination of mordants with madder.

Up until the beginning of the 17th century, the art of textile printing in Western Europe presents a disconnected history. There are isolated bits of information but there is no continuing thread. For example, there was a manuscript in the Bibliotheque Royale of Paris, written on paper and numbered 6741, compiled in the year 1431 by Jehan le Begue (*2*). This work mentions recipes for staining or pencilling on linen cloth. The dye solutions were based on iron and aluminum mordants combined with various coloring principles. These colors were painted in the form of designs onto linen and were allowed to dry in. Jehan le Begue even mentions a discharge solution based on a combination of strong lye and alum. There are also examples of block prints from the 13th and 14th century in some of the important European museums.

It was not until printed calicos

were brought into Europe from India by the Dutch East India Company that a real interest in printing arose in Europe. The introduction of these beautiful and lively prints from the East caused a considerable disturbance among the manufacturers of woolen and silk fabrics in Europe because they posed an economic threat to these old and entrenched industries. In fact, England as well as France actually prohibited the importation, and even the manufacture, of printed calicos for many years. Even when calico prints were allowed to be imported, or printed, in England and France, they were still subject to a heavy duty for many years. The duties on printed calicos in England were not even repealed until the year 1830. The introduction of the bright calicos into western Europe came at a time however when the dullness of the middle ages was being thrown off and the ordinary person was ready to be titillated by bright colors. The exciting prints of the east caught on and even the common person was determined to have his bit of calico (*3*).

A local printing industry for the printing of calicos was bound to start. As to whether the first European plants for the printing of calicos were started in Holland, Germany, England or in France is still a moot question. Some writers have claimed that the British calico printing plants were started by the French Protestant emigres to England at the end of the 17th century. If so, then these emigres did not learn their art in France for there are no records to indicate that there were printing plants for the manufacture of calicos in France at the time that the French Protestants were self exiled owing to the revocation of the edict of Nantes by Louis IX in 1685. In any case, printing plants were in operation in the several countries by the beginning of the 18th century.

One of the best sources for local information about the European calico printing industry at the beginning of the 18th century comes from a manuscript which was presented in the year 1844 by Isaac Koechlin to the library of the Industrial Society of Mulhouse. This manuscript presents a record of the beginning of calico printing in Switzerland and was written in French by a Jean Rhyiner of Basle. The manuscript was commenced in 1766 and the last dates in it are 1783. Rhyiner reported that the Dutch and their neighbors in Bremen and Hamburg were the first to make prints in Europe and carried on a very large business. He pointed out that the European printed goods were much cheaper than the imported Indian goods and the great demand for these printed fabrics had caused the print works in Amsterdam to increase greatly in number (*4*).

Figure 2

Weaving calicos in India (18th century)

In the year 1700 there were three firms in Switzerland who were doing an extensive business in imported Indian goods and they would purchase the goods and then have them printed in Holland. One of these firms, namely, Emmanuel Rhyiner's Widow and Company, managed to place one of their relatives, Samuel Rhyiner in Amsterdam to pick up information on how printing was done. This Samuel Rhyiner returned to Basle and helped set up a little plant for printing in 1716 for the Rhyiner family.

The establishment of the Rhyiners as well as those of their other two competitors was very small. It consisted of a small wooden house with three or four printing tables and a capital of 6,000 francs. The company printed enough goods for their own trade in Indian calicos and the annual sale price amounted to 30,000 francs of which the printed fabrics amounted to 7500 francs. By 1732 the firm confined itself entirely to printing.

M J Rhyiner, writing in 1760, complains of the caution of his forebears in not expanding their business quickly when they had the chance. He says—

> "The demand for prints was very large, and if at this time, and for thirty years afterwards, the business had been pushed, great fortunes might have been made. But our predecessors were satisfied with moderate advantages, did not care to trade upon borrowed money, and were very cautious in giving credit, satisfying themselves with a modest and not a brilliant fortune."

He says that in 1750 Rhyiners was selling 80,000 francs worth of printed fabrics and that—

> ". . . if at this time we had accepted borrowed capital, and extended our business, we should have made a fortune, and prevented the establishment of works in Mulhouse. The Mulhousiens finding in their town a crowd of print buyers who were always complaining that they could not get supplied at Basle, and knowing also that money was abundant in Switzerland, and worth no more than 2¾%, took advantage of these circumstances."

Rhyiner, writing in 1760, cried for the good old days in the printing business of his Father even as some printers might do today. At one time the Swiss workman was one of the cheapest laborers in Europe but by 1760 things were beginning to change and only the village labor was low enough to enable the Swiss manufacturers to keep their advantages in the foreign markets. Rhyiner says—

> ". . . but the luxury of the towns is gradually gaining upon the country people, and will soon bring them down to a level with their competitors. As to the manufacturers in towns things have quite a new complexion, and the Switzer who in the past inculcated economy by example now gives lessons in extravagance. From the first of the merchants down to the lowest of the labourors each one lives beyond his means, and spends more than needful upon his table, his clothing, and his dwelling; along with that the assiduous

attention to work is nearly altogether gone. . . . The floating capital required in business becomes daily greater and greater on account of the slowness with which payments are made."

Rhyiner was apparently preparing his manuscript for a son or a relative who was to enter the business for he gives many bits of advice on all facets of the operation of a print plant—Many of which are still sound today. The important qualifications for a color mixer were no different than those required in a modern print shop today. Rhyiner says—

"The qualities required for this occupation are very various. Considered from a proper point of view, the individual ought to mave an extensive theoretical knowledge of general chemistry, and the kind of work with which he is immediately concerned, as of the nature of the effect in the composition of colours. He ought to have confirmed his knowledge by long practice, and have constructed from his experience a safe and regular system according to which his work should be conducted. But such a colourist would be a phenomenon; at least no such person has made his appearance in our country. Our colourists are for the most part ignorant machines who trust to good luck without knowing why; besides that, they are detestable mountebanks who strive to hide their ignorance under the cover of a jargon of recipes which they do not understand, and with which they are perpetually putting their employers into danger and expense. Numbers of these knaves spend their lives in going from one works to another trying to gain the confidence of their employers, to whom they promise wonders, which for a time satisfies them, during which they profit all they can; and when they see that confidence in their ability is declining they change their place to figure elsewhere. As the proper regulations of a works are simple enough it is not difficult for them to learn something, but they always want to correct and change until at the last they cannot do the simplest thing with certainty. They are insane enough to think that the more drugs they can put into a colour the better it will be. The manufacturer who is governed by them walks like a blind man. . . ."

"A valuable quality in a colourist, and with which I will finish this article, is that he should be truthful, and not strive to excuse or to deny mistakes which he may have made, or to lay the blame upon somebody else, for by this reprehensible conduct he misleads the manager in his efforts to correct bad results. When the manager finds something wrong in the prints he is anxious to discover how it has happened; he questions the workmen, especially the colour mixer and the dyer, and it is generally found that the fault lies with one or other of these two; but if each lays it upon the other the manager does not know how to act, and may lose time and do injury by working in the wrong direction. Instead of that, if a fault had been committed (which might happen with all care), or if a colour is known to be wrong, and the reason not known, the colourist ought to say so, that the cause may be ascertained. The colourist cannot be too strongly impressed with this. I know by experience that nearly all are accustomed to offend in this particular. If a colour is not right they throw it away and try another, and perhaps throw that away also without saying a word, although probably the error could be corrected at once. It is evident that most of the spoiled pieces which come up, sometimes one after another, are owing to the want of honesty in these people. They must be looked after as much as possible, which is the best way of preventing them deceiving us. The proverb is here very true, 'The farmer's eye makes the fields fertile'."

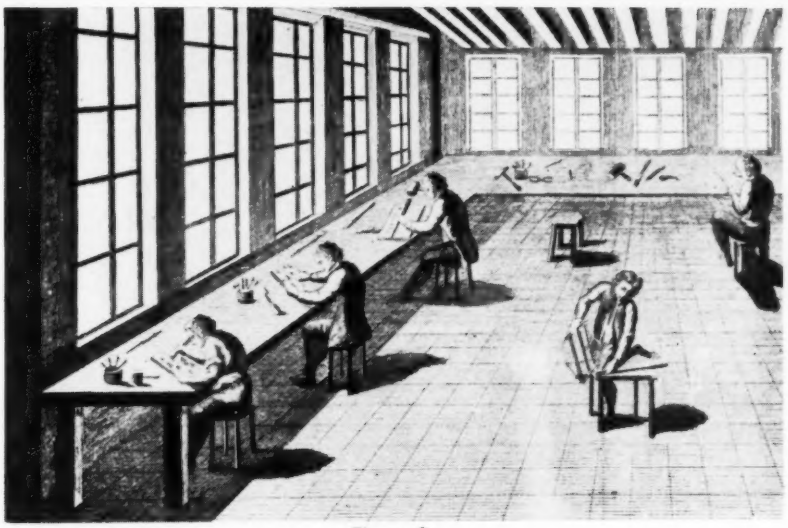


Figure 3

Carving Print Blocks in 18th century printing establishment

Rhyiner gives many pointers which furnish us a true insight into the technical as well as the labor and financial problems of calico printing in the 18th century. According to Rhyiner, they preferred the calico made in India for printing as they thought that it was much better than that made in Europe. Indian cloth was received already bleached but it was strongly sized with rice starch and there was some problem in removing this. Bleaching of European-made calico was carried on by the old fashioned method of alkali boiling and exposure to the sun. In the days of Rhyiner there was no machine printing. Printing was done by hand and by the use of carved wooden blocks. The amount of labor that went into a multi-colored print in Rhyiner's time is obvious from the following long and complicated procedure.

About 1776 a print containing a ten color design was executed as follows. "The colors being black, three reds, two purples, two blues, green and yellow." The piece after being calendered was first printed with a mordant for the black and then with the mordant for the first red and dried; the mordant solutions themselves were complicated and were not a simple solution of an inorganic salt. These mordants were carefully balanced solutions which had been worked out empirically after many many years of trials. As for example, the first red mordant might be as follows:

Decoction of Redwood — three gallons
White Liege alum — 8¼ pounds
Acetate of lead — 2 pounds
Orpiment — 10 ounces
Salammoniac — 13 ounces
Corrosive sublimate — 1 ounce
White chalk — 2 ounces
White arsenic — 8 ounces
Salt Petre — 6 ounces
Verdigris — 4 ounces
Vinegar — half gallon
Potash — 10 ounces
Soda — 10 ounces
Spirits of wine — 4 ounces

After the first two mordants had been printed on, and after drying, the second red mordant was then printed on, and the piece was dried. Then came mordants for the third red and the two purples. The cloth was carefully dried after each successive mor-

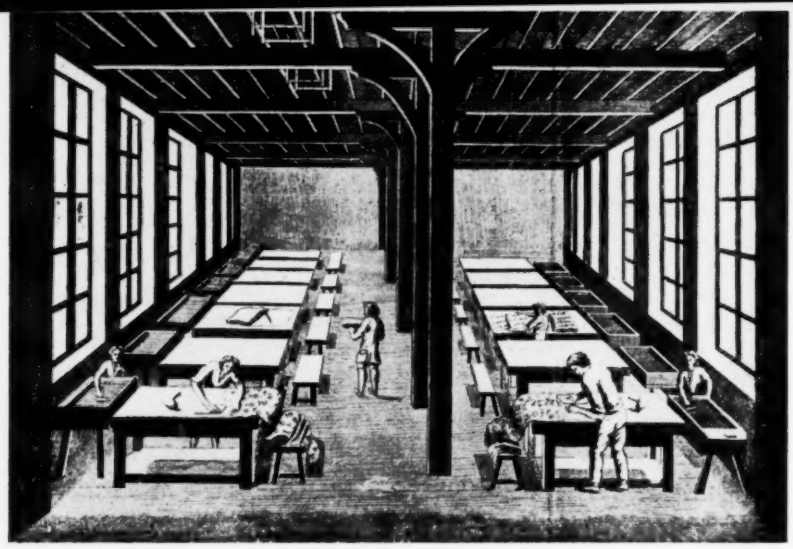


Figure 4
Printing calicos in 18th century. Note color tub and "tearer" next to each print table

dant was printed on. Obviously, the printing on of the mordants alone would have taken many days. Finally, the goods were dyed in madder and then exposed for several days on the grass to help clear up the grounds and finally washed in cow dung and bran until the whites were clear of loose color.

After this long procedure, the first blue was printed on and the piece dried and then washed again. Next, the second blue was printed on, the goods dried and washed off and finally the yellow was printed on, which falling in place on the blue produced green.

If we were to examine the various mordant and dye formulas and the printing methods from the chemical viewpoint in Rhyiner's writings in the year 1746, and compare these formulas and methods with those in use in 1846, a hundred years later, and just before the discovery of synthetic dyestuffs, we would be astonished to find how little difference there had been made in the materials themselves (*5, 6*). Only mechanical improvements had taken place. But by 1876 (however), things were completely different for the discovery of the synthetic dyestuffs had cause a great revolution in printing methods and the changes which took place in a 20 year period were greater than had occurred over the preceding 2000 years.

Now to get a view of another side of the calico printing industry in the 18th century, we turn to an Englishman, or at least to an Irishman living in England, a Charles Obrien who styled himself "callico printer." In 1790, Obrien published in London a volume which was the first published book devoted entirely to calico printing. As was the custom in those days, a simple title was not enough and Obrien was in style. The title of his book is "The British Manufacturers Companion, and Callico Printers Assistant; Being a Treatise on Callico Printing, in All Its Branches, Theoretical and Practical; WITH AN ESSAY on Genius, Invention, and Designing; RULES for Drawing, Cutting, Printing, Engraving, Colour Making, Bleaching, etc; Suggestions for the Advantage of Manufacturers; and many valuable Hints to the Proprietors of Print-fields" (*7*).

One can well see how suggestions on designing, drawing and printing would be useful to anyone engaged in calico printing but an essay on genius might seem out of the range of practical matters. The problems of print design however in the times of Obrien often needed the mind of a genius.

From a complete reading of the book it is obvious that Obrien must have been a print designer who later picked up a considerable amount of knowledge of calico printing as it was done in England in the latter part of the 18th century. As far as the dyeing or color making part of the book is concerned, Obrien doesn't give a single formal recipe. He apparently wanted to impress the reader with the idea that he could say a lot on these subjects but after all he was writing only for the experts, and they should know what he might be hinting at. On the mechanical side, that is the design of prints, the carving of the blocks and the actual mechanical printing-on, Obrien is detailed and specific. Probably no book has ever been printed since which gives a more detailed and careful story of the problems and the many special techniques required in the preparation of blocks for printing.

Before giving examples of some of Obrien's actual writings, it is well to know just what were the essential points in the process of printing with wooden blocks. Even the names and terms for the various workers who carried on different stages in the preparation of the printing blocks themselves are of importance.

First, a pattern had to be designed. Those who could invent designs were called pattern-drawers or designers. After the pattern was designed, it had to be traced out or put on to the block. Those persons who transferred the designs to the wooden blocks were called putters-on the block or drawers. These craftsmen required a great deal of skill and thought in their work, as the problems for laying out each block for each mordant so that one color would fit into its proper place with the other colors required considerable skill and was of great difficulty. Finally, after the designs had been placed on the various blocks, a cutter, who himself had to be a skilled carver and who had to have a thorough knowledge of printing, cut away the blocks so that each section of the design for each mordant to be printed was left in relief.

Even the manufacture of the separate blocks which were used for printing was a special business requiring a special skill itself. There were skilled block makers whose time was devoted solely to the preparation of satisfactory blocks on which designs could be placed and cut out for printing. If we remember that in the use of these wooden blocks there would be shrinkage, and surface changes, we realize how complicated the manufacture of a satisfactory wooden block must have been. Now to the actual printing itself (*8*)—

> "By the side of the printing table stands a tub or drum near to the printer. This drum is filled with thickening of paste, starch or gum, according to the required work. Over this thickening is closely and tightly fixed a covering of thick but finely woven cloth, usually manufactured for the purpose. This is kept moist by the thickening which it touches below, and upon which it is pressed every time the printer puts his block upon it. A little boy called a tear-boy has beside him a pot of the required mordant properly made and thickened by the colourman; he dips a brush in this mordant and smears enough on the cloth that forms the drum-head, for the block to take up and apply to the cloth. The printer usually presses the block twice on the drum-head so smeared, and when he fixes it on the cloth gives it a gentle blow with a wooden mallet." (*8*)

After printing-on the thickened

mordant, the goods would be dried in a warm room with a damp atmosphere for a day or two in order to fix the mordant. Then followed an operation called dunging which involved passing the goods for many hours through a bath containing cow dung. This operation apparently removed some of the loose mordant and helped set the remaining mordant more thoroughly in the goods. Following dunging and rinsing, the goods would then go to the copper to be dyed with madder or some other dyestuff which would form a final color lake with the mordant fixed on the fibers. Following this, the goods would be rinsed and then exposed for days to the action of the sun to clear up the white portions, rinsed again and finally dried and perhaps calendered or finished with starch. If the prints contained many colors, then some of these processes might be repeated. Some colors such as those based on Indigo were even pencilled in after most of the design had been brought out by mordant-dyestuff processes.

Now to get back to Obrien. While some of his detailed instructions may be of no use to us today, his ideas, his advice and even his gossip, can give us a feeling for textile printing in 18th century England.

To begin with, Obrien's remarks on what constitutes a good pattern for printing poses a problem which even exists for all print manufacturers today. Obrien says—

> "It may, nevertheless, be observed that it is difficult to say, what really constitutes a good pattern, as decisions on that subject are formed by different persons from very different motives. For instance, a Draper's determination of one is biassed by what will best suit his line of trade; a Printer's, that which is adapted to produce the desired effect at the least expense; while a buyer's opinion is guided by what is more generally exhibited in the shops; and many patterns acquired the character of being good ones, merely from a Draper having it in his power to command a general display of them under every advantage; for the most fanciful and best executed pattern would have little chance of selling well if seen but in a few places, or the sale not otherwise forwarded, as it then would not have the appearance of a generally approved one, and consequently it would be disregarded in a proportionate degree."

The pressures by the purchaser of prints for things new and different were no different in Obrien's time than they are today. Obrien complains as follows—

> "It often happens, too, that many (Drapers particularly) are violent in requiring something new, or totally different from what has ever been seen; all this has a busy sound, and in idea promises a great deal, or at least implies the hope of a great deal; but could it be procured, the expectation might not be answered, as it generally seems that when anything happens to be produced, very different from the common run or appearance of work, or what may be called the reigning style, it has not the chance of getting into vogue, for reasons already given, except when a Draper of eminence, who holds his connections as it were by a bridle, is determined to push what is a favorite of his, though even that will not always succeed; for somehow or other capital blunders are now and then made by the most experienced in the choosing of patterns."

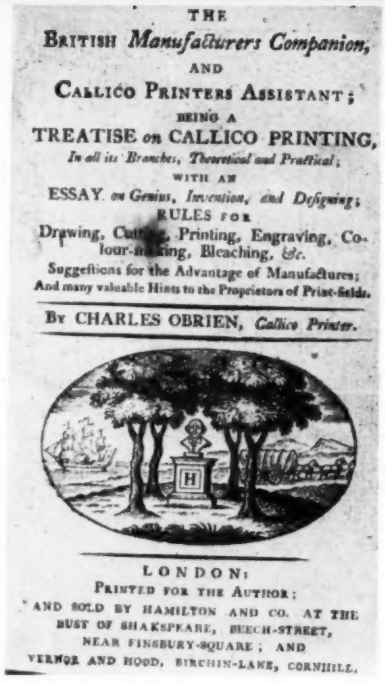

THE
BRITISH *Manufacturers Companion,*
AND
CALLICO PRINTERS ASSISTANT;
BEING A
TREATISE *on* CALLICO PRINTING,
In all its Branches, Theoretical and Practical;
WITH AN
ESSAY *on Genius, Invention, and Designing;*
RULES FOR
Drawing, Cutting, Printing, Engraving, Colour-making, Bleaching, *&c.*
Suggestions for the Advantage of Manufactures;
And many valuable Hints to the Proprietors of Print-fields.
BY CHARLES OBRIEN, *Callico Printer.*
LONDON:
PRINTED FOR THE AUTHOR;
AND SOLD BY HAMILTON AND CO. AT THE BUST OF SHAKESPEARE, BEECH-STREET, NEAR FINSBURY-SQUARE; AND VERNOR AND HOOD, BIRCHIN-LANE, CORNHILL.

Figure 5
Title page of first printed book on calico printing (1790)

Obrien furnishes the most minute details for the design of patterns, rules for putting the patterns on the block, and even goes into great detail concerning the kinds of wood best suited for printing different types of patterns. Obrien does not neglect the most trivial instruction and he constantly points out to each worker how a slight error in his own particular specialty, whether carving of the block, or laying on of the design, or manufacture of the block, will affect the final print.

The second part of Obrien's book is devoted to what was called copper work, fielding and color making. Copper work meant the work that was done in copper kettles, that is to say dunging and dyeing. The term bleaching was often used by the calico printers to indicate whitening of the unprinted parts of the goods by exposing the latter to the sun after printing and dyeing. While Obrien did not give detailed dye formulations, his comments on the various print colors and how they were obtained are of particular interest—

> "The most durable Black and Purples are brought up in madder, by the agency of iron liquor; reds by alum and occasionally tartar, salt of lead and iron liquor, to vary the hue to a Pink, a Blossom, a Chocolate, etc. Yellows in weld, by alum and tartar; Olives, Drabs, etc. by alum, tartar and iron liquor; Doves, Browns, Greens, etc. in Sumach, Fustic, Greenwood, etc. by alum, tartar, and iron liquor; Blue from Indigo or woad, by the agency of ash, lime, and orpiment."
>
> "Less permanent blacks, reds, purples, pearls, etc. are brought up in logwood, brazil, bark, etc. by the agency of iron liquor, galls, copperas, etc., but in skillful hands are to be much improved."
>
> "Chemical browns, buffs, pale greens, blue, salmon, and other colours are, by the agency of Tar acid, Iron liquor, Verdigris, Woad, Annatto, etc., brought up or struck with lime and other colours, such as berry yellow, pencilled blue, procured from indigo, etc., require steaming or rincing in water only."
>
> "For conveying these mixtures to the cloth, various articles are necessary to be used according to certain circumstances; these vehicles are gums and paste; paste being of a more compact consistency than gum diluted, is used when lines or fine bodies or shades are required to be accurately expressed; diluted gum is more used in conveying solid bodies, in which no great accuracy of shape is required."
>
> "Of gums, tragacanth has several advantages, and if properly managed would distribute as well as the arabic, but this article, as well as the oak-gall, is not always made the most of."

Sometimes today some of our non-technical friends say that prints aren't as good or as fast as they were in the good old days. Obrien had the same thing to contend with almost 200 years ago and he answers straight forwardly as follows—

> "It is here offered to set persons right in respect to colours, who affect to say that as good were done fifty or sixty years past, or as good were done two thousand years or more past, the very means as well as articles being of as ancient a

standing, indeed the origin can hardly be traced; so in printing, the method immemorial has been by using alum, etc., to procure and fix the colouring particles. It may even be said what we call new colours have been produced many years past under different appearances. If there be any real improvement, a principal one is in the mode of cleansing the cloth, and that perhaps is only in being rather more expeditiously performed than before."

Obrien gives in his book some of the interesting gossip of the printing business of his time. Apparently, Obrien had an intimate knowledge of all of the London print houses and there must have been a great deal of gossiping going on. For example, in discussing a case of pattern piracy he says—

"The case was a pattern of Messrs Greaves Newton and Co's being closely imitated by Watson and Co. the fact not being contended, but only a misconception of the meaning of the act, Lord Kenyon in his charge, severely reprobated the practice of such piracys, as bidding defiance to law, and the protection parliament had granted to genius and industry; and plainly intimated that if such a case came again before him, of an imitation being so near the original, as to pass for it, very little indulgence indeed might be expected."

Obrien also reported that—

"Arbuthnots made some stir with green stalks on chintz, but the colour was very loose and soon 'flew' leaving the flowers scattered here and there without stalks or any other appendage."

And that—

"Preston's chemical colours a few years afterwards made some noise, but a report was spread that they were oil colours and that the heat of a fire would destroy them, and they were soon extinguished; a blue and gold or black and orange style, said to be Naylor's invention, were also in loose colours, from the ease and facility of its execution it drew many into the business that perhaps now wish they could eligibly quit it, for the price of the work had decreased from 12 pence or more per yard for printing down to 3 half-pence or even 5 farthings."

Obrien also reports that—

"It is notorious that in many commissioned and other shops, the lowest chemical work, even with such colour as almost, literally speaking, would shake off, is warranted and ticketed as fast and often called chintz."

Perhaps the earliest notice we have of the start of printing from engraved cylinders other than the original patents is contained in the following quotation from Obrien's book which appeared only a few years after Bell's patent—

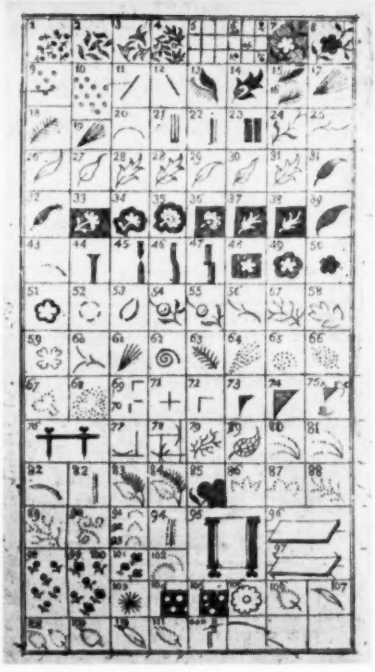


Figure 6
Frontispiece of Obrien's book depicting typical print patterns used in 18th century England

"Innovations, particularly on a mechanical principle, are spreading pretty widely in the country; and machines of various constructions are increasing about town; and perhaps many town printers will hardly credit that engraved cylinders perform as expeditiously as the common pin ones, that a machine for block printing was invented and used sometime, with which anyone could print as easily as turn a winch (the specification for a patent was even made out) and that in machine printing, four cylinders may be used at once in different colours."

"The writer can speak of this with confidence, having the advantage of knowing what has been done and what has been further attempted; and was absolutely in a concern where an almost general course of printing by machines only was to have been attempted, a system being formed for that purpose; but certain considerations, among which the idea of such modes being ultimately injurious, from enabling the proprietors to under-work others, operating not a little with him, set the plan aside."

Obrien undoubtedly referred to what is believed to have been one of the largest and most disastrous commercial failures in the print trade which ever happened in England and this took place just before the publication of Obrien's book. The failure was that of the firm of Livsey, Hargreave, Astie, Smith and Hall, of Mosney, Lancashire. This was the firm which employed Thomas Bell, the improver of the roller printing machine, and the inventor of the doctor blade. Here was brought out and partly developed just before the failure, the system of machine printing which finally caused such a revolution in the calico printing trade. Livsey and Company was noted for its willingness to try improvements in calico printing but nevertheless even the adoption of Bell's invention did not keep it from failure.

Obrien had this to say about Livsey and Company—

"It is said that this place was the means of giving bread to near 20,000 persons; cloth in whitstering has occupied ground twelve miles in length, near 300 tables have been employed, and near 40 coppers at work at one time, 6 or 700 cylinders have been cut or pinned, common prints etc. innumerable . . . but the price of labour was latterly reduced as much as possible, by converting (as done at other places) herds of Lancashire boors into drawers, cutters, printers, machine workers, etc. and the work was proportionably execrable."

"Of the failure it may be said who in times past would have believed, or who in times to come will, that a connection reputedly worth about 150,000 pounds at its commencement, should in a few years crumble under the deficiency of near a million and a half; and that among those involved in the accommodation labyrinth, who fell in consequence (exclusive of Gibson and Johnson), some were for 10 or 20,000 pounds who comparatively speaking possessed little indeed? Saying nothing of those who lingered some time, or those who were more or less shaken, or may be shaken at this moment."

Even today when we continue to see the passing of some of our largest textile enterprises, we may well say with Obrien—

"Who in times past would have believed such could happen?"

BIBLIOGRAPHY

(1) Pliny the Elder, "Natural History", English translation, Bohns Classical Library, London (1855-7).
(2) Merrifield, "Original Treatises on the Arts of Painting", London (1849).
(3) Baines, Edward, "History of the Cotton Manufacture in Great Britain", London (1835).
(4) O'Neil, Charles, *Textile Col* **1**, pp326-53 (1876).
(5) Persoz, J, "Traite theorique et Pratique de l'impressions des tissus", Paris (1846).
(6) Parnell, James, "A Practical Treatise on Dyeing and Calico Printing", New York (1846).
(7) Obrien, Charles, "The British Manufacturers Companion and Callico Printers Assistant", London (1790).
(8) Cooper, Thomas, "A Practical Treatise on Dyeing and Callicoe Printing", Philadelphia (1815).

• PATENT DIGEST •

PAUL WENGRAF

TARNISH ON COPPER ROLLERS IN VAT DYE PRINTING—Prevented by Copper Chelates D,2,01

USPat 2,705,668 (Allied Chem & Dye Corp—Fleysher)

Many indigoid vat dye pastes applied from copper rollers cause a phenomenon generally termed "copper tarnishing." It manifests itself either in the form of stains on the copper surface or as a deposit of a difficult-to-remove film. The reason for this drawback may be a reaction of the printing paste or of the dyestuff proper with the copper surface. At any rate, the nature of this reaction is not quite understood, as the author indicates in the preamble to this patent. Since tarnishing has to be considered a serious handicap in printing with indigoid vat dyes because of the gradual deterioration of the rollers and the engraved portions, the object of the current invention is to prevent formation of the tarnish whatever the causes may be. The amount of tarnishing of a given paste can be visually determined by evaluating the stain formed on a polished copper plate after a sample of the paste is left thereon for a certain time.

It has been observed that tarnishing can be suppressed by incorporating a *copper-salt* of one of the known sequestering (chelating) acids, eg, ethylene diamine tetra carboxylic acid (the product contained in the commercial "Versene"); other polycarboxy amines of this class, such as imino diacetic acid, nitrilo triacetic acid and many other known products, are enumerated.

This effect *cannot be explained by a mere chelating action* on copper particles, because, for instance, the tetrasodium salt of ethylene diamine tetraacetic acid does not prevent tarnish formation in contrast to the corresponding copper salt. This unexpected effect has been proved by the following example:

A paste of a dibromo indigo dye (25% solids) was applied in eight equal portions to a polished copper plate. One of the specimens did not contain any additive, the other seven were blended with copper sulfate, with copper acetate and with tetrasodium-ethylene diamine tetraacetate in varying concentrations, and finally the last sample with a mixture of hydrated copper sulfate plus the sodium salt of the chelating acid. Only the last sample did not leave any stain on the copper plate after the paste was removed with tepid water. The other seven samples caused heavy staining.

Similar effects resulted when a copper chelate was added to other indigoid vat dyes, such as Brilliant Indigo 4 BR Paste (*CI* 1184), Vat Brown G Paste, Vat Orange R (*CI* 1217), and many other brands known per se to cause heavy copper tarnishing in printing.

The Patent Office cites Tech Bulletin #1 of Versenes, Inc, Framingham, Mass, "The Modern Chelating Agent—Versene." The publications of this company, a subsidiary of Dow Chemical Co, stress generally the effect of Versene in overcoming difficulties in vat dyeing by sequestering metallic ions of any kind.

APPARATUS FOR CONTINUOUS MULTICOLOR PRINTING AND FLOCKING (D, 4)

USPat 2,695,244 (United Merchants and Manufacturers Inc—Fountain)

The patented apparatus is adapted to a continuous process of printing a color paste, then (in the same step) an adhesive, and finally flocking. By the special arrangement described below, multicolor designs may be printed, partly or completely covered with colored or noncolored flock; also flat printed designs can be printed in register with colored or noncolored flocks at will. Further, by using the doctor blade as a color furnisher and

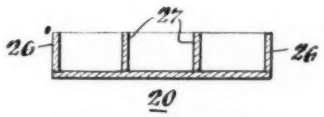


Figure 2—USP 2,695,244

inserting several stops or walls in the nip between the blade and the pressure roller, different colors can be printed over the width of the fabric (as used in comparatively trying out different printing pastes); thus a great variety in printed and flocked goods can be produced. The printing paste may contain some adhesive, providing for complete flocking of the printed design; half-tones produced by shaded-off engravings will contain in this event merely negligible amounts of adhesive in the lighter portions of the design so that here only the darker, deeper engraved portions will retain flocks in subsequent flocking operations and so on.

The apparatus (see Figure 1) comprises a standard printing machine. (The right portion of this drawing, which illustrates a conventional drying chamber, is omitted.) The fabric coming from roller (10) is carried to the printing roller (15) where the paste or pastes is applied to the fabric by the doctor blade (20) optionally partitioned as shown in Fig. 2. After the print paste, eg, a pigment color, is applied, quick drying may be brought about by drying lamps (24), whereupon an adhesive is applied from a hollow cylinder stencil (28) that is in exact register with the movement of roller (15). Then the fabric is flocked in an electrically operated flock box

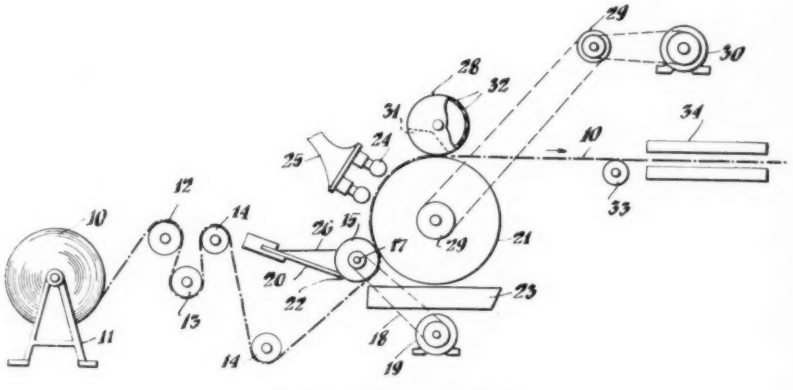


Figure 1—USP 2,695,244

(34), dried, and rolled up. The lamps (24) do not have to be used if the adhesive is added to the color printer by roller (15).

It is obvious that manifold combinations of flat prints with flock prints can be effected with this machine, particularly by using multicolor printing machines instead of the one-color machine, as illustrated in another embodiment.

Among the references cited by the Patent Office:

USPat 1,673,933 (Cadgene and Du Pont/1928): a machine for simultaneously printing flat and bas-relief effects. It comprises the combination of an engraved roller and a rotatable stencil.

USPat 2,084,827 (Schwartz-Tenny/1937): a multiple flock printing device characterized by alternating flocking units and stencils all being in registration. Means for blowing off the excess flock are provided.

USPat 2,206,570 (Johnston/1940): a multicolor flocking device comprising a stencil roller fitted on the inside with partition walls to distribute flocks of different color on the adhesive-prepared fabric.

USPat 2,217,133 (Overlack/1940): a multicolor-printing machine characterized by an arrangement of cylindrical stencils and drying elements between the stencils.

USPat 2,533,985 (Aronstein et al/1950): a multicolor flocking apparatus. The fabrics are first printed with adhesive, flocked, cured and finally printed (in the same machine) with perfect registration by a multicolor design so that all the flock is covered with different colors.

DYEING JIG——Tilting the Material for Leveling-out of the Edges (D, 6)

USPat 2,696,421 (Celanese Corp of America——Normand)

In the jig dyeing of fabrics, the edges frequently appear in a lighter shade than the central portion of the goods; also, in the case of dyeing with mixtures of dyestuffs, the edges may show a different color than the center.

It has been discovered that levelness of dyeings in this respect can be improved by tilting the material alternately in opposite directions during dyeing or upon its leaving the dyebath. By lowering one longitudinal edge of the fabric wound upon the roller below the other edge, one can make the adhering dye liquor flow diagonally across the material to the lower edge. After the fabric is passed again through the dyebath and the roller tilted in the other direction, the dye liquor will flow inversely to the other edge.

This operation may be effected by *tilting the entire jig.* In this event the lower edge will remain in the dyebath for a longer time, producing locally a darker shade; as the jig is tilted in the inverse direction, darkening will take place on the other edge, thus counteracting the aforementioned tendency of the edges to appear in a lighter or different shade than the center portion. The degree of tilt may be 10 to 20° from the horizontal line. The jig need not be used in tilted position during the whole operation: part of the dyeing can be done with the jig in normal, horizontal position. Also, the rollers upon which the material is wound may be tilted separately while the jig is maintained in fixed horizontal position. It is preferable, however, to tilt the entire device because of the simplicity and because it leaves the respective lower edge immersed for a longer time in the dyebath.

The accompanying drawings show a jig of the patented construction in end elevation (Fig 1) and in side elevation (Fig 2). This jig does not differ from customary jigs except that it can be tilted by means of lifting jacks (26 and 27), positioned under brackets (24 and 25), which are fastened to opposite ends of the machine frame (1).

Example: tank (16) was filled with a dyebath containing a mixture of dispersed blue, brown and pink acetate dyes and the usual dispersing and swelling agents. A cellulose acetate fabric was passed through the bath at 80°C, the jig being tilted at 20 degrees in one direction and, after each passage, in the opposite direction. After 20 passages the jig was returned to the horizontal position and 8 more passages given. The resulting shade was a uniform blue over the width of the fabric. When tilting was omitted under analogous conditions, the edges were found to be lighter and yellower than the central portion of the fabric.

Among the references cited by the Patent Office:

USPat 1,598,627 (Voegeli/1926) describes a dyeing jig fitted with a cloth expander bearing a curved roller, which is movable to contact alternately either side of the fabric running through the jig.

USPat 1,773,169 (Cadgene/1930) describes an apparatus for ombré (shaded-off) dyeing, which contains several smaller tanks for the dye liquors. Dyes of different shades flow on an inclined fabric, which forms a kind of trap to partly mix the different colors by gentle squeezing.

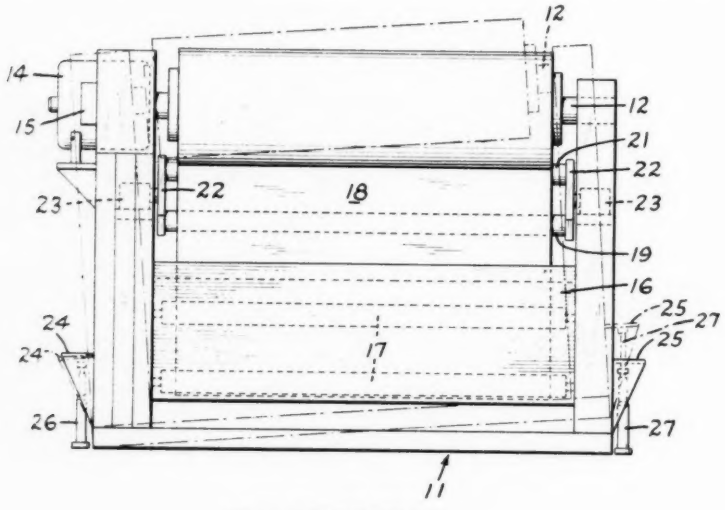


Figure 1-USP 2,696,421

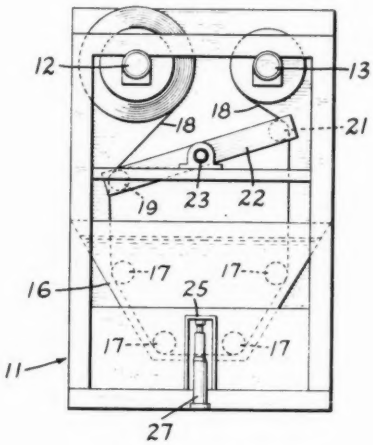


Figure 2-USP 2,696,421

News of the Trade

NID "Back-Home" Day

A full slate of activities has been planned for the 26th annual mid-summer reunion of the alumni of the two schools conducted by the National Institute of Drycleaning, Silver Spring, Md.

The reunion will begin Friday evening, August 10th, with a "Hello" party at the Shoreham Hotel.

Saturday morning will feature a panel discussion on management topics, an open house at NID and Institute Cleaning Plant, and visits to the Japanese, Russian and Egyptian embassies in Washington.

Saturday afternoon activities will be held in the General Course Classroom, School Bldg-NID, and will feature the announcement of winners in the "News-Ideas-Doings" contest and reading of the prize-winning essays; talks by C B Kasson, R R Street & Co on "Customers Wanted—No Experience Necessary" and Rodney E Callander, Callander Co, on "Box Storage"; and the dedication and tour of the C C Hubbard Memorial Science Laboratory.

A cocktail party, dinner dance and floor show will be held Saturday evening at the Shoreham.

Sunday's program at the Shoreham will feature in the morning: "America in the Future," a motion picture; "Automation in the Call Office," a talk by Hal LeRoy, Institute Cleaning Plant Manager; and "Science is Fine, But . . .," a talk by Noel Grady, Bishop David Freeman Co.

The program will conclude Sunday afternoon with a panel discussion on "Should a Drycleaner Go Into Shirt Finishing," and a talk by George P Fulton of NID on "Status of the Charged System to Date."

Registration fee is $15.00. Advance registration blanks may be obtained from Edna M Michelson, NID, Silver Spring, Md.

Philadelphia Quartz to Mark 125 Years

Philadelphia Quartz Co, Philadelphia, Pa, manufacturers of soluble silicates, will complete 125 years of business on July 21st. The observance will be marked this Friday by a holiday for all employees at the company's offices and plants.

(For a short history of the Company, see page 137 of the February 27, 1956 issue of ADR).

Francolor Opens US Headquarters

On June 14, Francolor Inc officially opened its United States headquarters at 162 Main St, Woonsocket, R I.

Guests from all over New England were shown different exhibits featuring pictures of the four factories operated by Compagnie Francaise des Matieres Colorantes, in France, at Oissel, at Villers Saint-Paul, at Saint Denis and at Saint-Clair-du-Rhone. Shade cards of CFMC's full line, which will now be available in the United States through Francolor Inc, the package which Francolor Inc uses for sampling and trial order purposes, as well as various prints of work which has already been done in the United States by customers of Francolor Inc were shown.

Jack H Firpo, executive vice-president of Francolor Inc was host.

New Abstract Service

Interscience Publishers, Inc, 250 Fifth Ave, New York, has announced the inauguration of "Quality Control and Applied Statistics Abstracts," a *monthly loose-leaf abstract service* covering the world literature on quality control, operations research and industrial applications of statistical methods of all kinds. More than 400 journals will be scanned for articles that present new information in the field, and the abstracts will be sufficiently comprehensive to show the significant contribution of each article.

"Quality Control and Applied Statistics Abstracts" will consist of one volume of about 1,000 pages yearly, divided among 12 issues, beginning in June 1956. The subscription price is $60.00 per volume.

Hart Products Opens New Labs in Jersey City

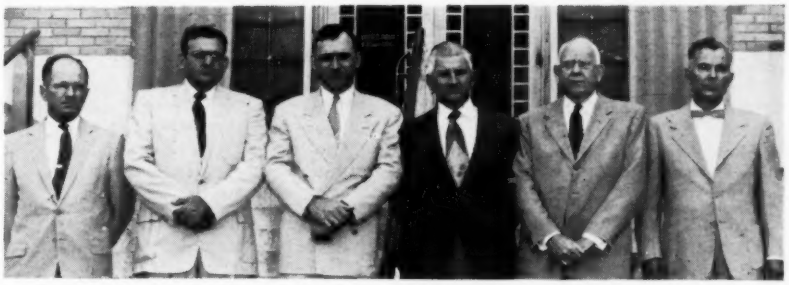
The Hart Products Corp has announced the opening of its new research and development laboratories in Jersey City, NJ. The new laboratory, which replaces one destroyed by fire in January, 1955, provides 4,000 sq ft of floor space with modern benches and facilities to accommodate the chemists. In addition, a separate laboratory room has been provided for large-scale process development work, equipped with 5-gallon glass and lead-lined reactors.

A special feature of the new laboratory is complete equipment for the development and testing of resin finishes for textiles. Included in the new equipment are: 3-roll laboratory padder, Launder-Ometer, tensile and tear-strength testers for textiles and leather, crease-resistance testers and curing ovens.

In addition to the specialized equipment, the laboratory has been equipped with the latest apparatus and instruments for the analysis and control of manufactured products.

The Corporation held a sales meeting at the Jersey City plant recently to introduce the sales force to a new line of textile resins. Sidney Cohen, research director, discussed types and properties of textile resins and was followed by A S Endler, who explained use, application and methods of testing textile resins. Mill application of textile resins was covered by Milton Greene and T R Scanlan, Jr.

Ralph Hart, president of the firm, in closing the meeting, stressed the importance to the textile industry of the newer type textile resins reaching the market in the last year.



MEMBERS OF THE COTTON CHEMICAL PROCESSING SECTION, Southern Regional Research Laboratory, New Orleans, La, slated to receive Superior Service Awards include (l to r): A L Murphy, A S Cooper, Jr, E M Buras, Jr, E J Keating, C F Goldthwait, and W G Sloan. Two members of this award group, J S McLaren and S T Voorhies, are no longer with Southern Utilization Research Branch, Agricultural Research Service, U S Dept of Agriculture, of which SRRL is headquarters.

The awards will be made in New Orleans at a later date for development of partially acetylated cotton, a product with high resistance to heat, mildew and rot.

Borden's to Open New Polymerization Plant in Alabama

A new polymerization plant with an initial annual production of 10 million pounds of polyvinyl acetate is to be opened at Demopolis, Ala, Aug 1 by the Polyco-Monomer Department of the Borden Company's Chemical Division.

Borden's will provide tank car, tank truck and drum shipments from Demopolis throughout the Southeast and Southwest.

The Chemical Divsion has been operating in the Alabama town since 1950, manufacturing urea resins and formaldehyde. The new plant will increase existing floor space by 10,000 square feet. Robert Stickney is superintendent.

Recipients of honorary degrees at the Philadelphia Textile Institute's Graduation Exercises, June 16th, 1956, are flanked by Bertrand W Hayward, PTI president, and W Lyle Holmes, Jr, president of Archibald Holmes and Sons, board chairman at PTI.

(L to r): President Hayward, F Everett Nutter, Malcolm E Campbell, Robert T Stevens and Mr Holmes.

Textile College Commencements

The textile industry, which is demanding textile college graduates to a far greater extent than is now being provided, eagerly looked to the various commencement exercises held last month to provide young men for its ranks.

Among the colleges which have been supplying graduates to the industry, Lowell Technological Institute held its 58th commencement, Philadelphia Textile Institute its 73rd, and New Bedford Institute of Textiles and Technology its 56th.

At Lowell, seventy-four degrees were awarded, with Martin J Lydon, president, and Samuel Pinanski, chairman of the board of trustees, officiating. Nine graduates received U S Air Force commissions as second lieutenants. Honorary degrees of Doctor of Science were conferred on Robert Cutler, chairman of the board of the Old Colony Trust Co, commencement orator; Henry H Armsby, chief for engineering education, U S Office of Education; Ralph Lowell, Boston financier; Barnett D Gordon, Manchester, N H manufacturer; and Edward B Hanify, Boston attorney.

At Philadelphia, seventy-eight Seniors were awarded degrees and diplomas. Honorary degrees were conferred on Malcolm E Campbell, dean of the School of Textiles, N C State College, principal speaker at the exercises; Robert T Stevens, president of J P Stevens Co Inc and former Secretary of the Army; and F Everett Nutter, a trustee of PTI and former vice president of Goodall-Sanford, Inc.

At New Bedford, forty-four graduates received their diplomas. Honorary degrees went to Malcolm E Campbell; E Ferris Almada, trustee, retired textile executive; William E Jennings, general manager, Fibers Application Lab, National Aniline Div, Allied Chemical & Dye Corp; and Fred Taylor, industrialist and educator. The commencement address was delivered by Daniel L Marsh, chancellor of Boston Univ.

AATCC awards at the three schools went to Philip S Lamprey at Lowell, Jordan Dannin at Philadelphia, and Eugene P Damm, Jr, at New Bedford.

TRI Cotton Research Committee Meets

The ninth semi-annual meeting of the Cotton Research Advisory Committee of Textile Research Institute took place in the newly constructed Edward T Pickard Seminar Room in the Institute's Princeton laboratories on June 1. About forty persons—committee members, TRI staff, and guests—attended. Results of the past four and one-half years of work on the Cotton Research Project were summarized by Ludwig Rebenfeld, project director; William Virgin, staff mathematician; and Helmut Wakeham, director of research.

After a thorough discussion of its findings, the Committee gave consideration to several proposed approaches for a new five-year program. This will involve the effects of fiber crimp on processing characteristics and fabric performance, further processing evaluations of "master cottons" made from widely differing cotton varieties, receptivity of various cottons to chemical treatments, and the effects of chemical finishing of the "master cottons" on fabric properties. The new program will be written up in detail for the current sponsors of the Cotton Research Project, but the write-up will be available to all TRI member companies who indicate interest.

Union Carbide to Build at Westchester Site

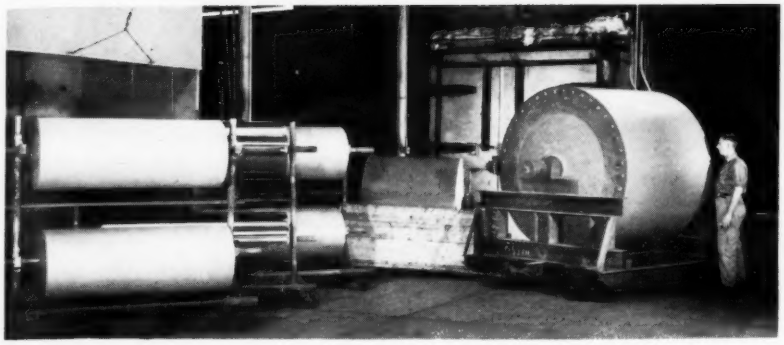
Union Carbide and Carbon Corporation's plans for building on its Westchester property near Tarrytown, NY, were announced last month by Morse G Dial, president. The 280-acre site in the towns of Greenburgh and Mount Pleasant was purchased by the Corporation in 1952.

Present and future needs of the Corporation require the construction of certain buildings in addition to the home office building to be erected in New York City. These are: an office building to house those engaged in work for sales departments of several of the Corporation's Divisions; a basic research laboratory to conduct general research for the Corporation; and a service laboratory devoted to research work on customer's problems.

It is planned to start construction of the new buildings early in 1957, and the schedule calls for their completion early in 1959. The buildings are to be two or three stories high, with exterior walls of brick, stainless steel, and glass. A central utilities building and a cafeteria for employees also will be constructed.

These new facilities will eventually be staffed by approximately 1,000 people, some of whom are now in the employ of the Corporation in New York and elsewhere. As plans mature, any individuals affected by this program will be advised, and in each individual case every consideration will be given to minimize any inconvenience resulting from relocation or reassignment.

This building program in Westchester in no way affects the Corporation's plans for its new home office building on Park Avenue between 47th and 48th Streets in New York City.



View of the entrance to baking oven, designed especially for "Teflonizing" of textile drying cans and slashing cylinders, installed recently by General Plastics Corp.

General Plastics Installs New Baking Oven For "Teflonizing" of Drying Cans

Robert Goldsmith, president of General Plastics Corp, of Paterson, NJ, specialists in the application of antistick industrial surfaces, announced recently that his firm had completed installation of the industry's largest baking oven for applying Teflon coatings on textile production equipment.

The new oven is equipped with controls to complement the particular application involved and to achieve accurate conditions for the baking process. Measuring almost 1,700 cubic feet, it is now reported possible to bake the coatings on as many as 24 cans in one operation.

Providing facilities to coat virtually any size equipment, the new oven is said to extend the production benefits of Teflon and other special industrial surfaces to many new operations, heretofore impossible to achieve. It is reported that a single unit of production equipment weighing 10½ tons was coated and baked during the first week the new oven was installed.

Celanese Graduate Fellowships

Celanese Corporation of America recently announced that it has established graduate fellowships in 13 universities in its continuing program to assist and encourage development of deserving graduate students for scientific careers.

Fields of study covered by the fellowships include textiles, chemistry, engineering, physics, cellulose and plastics. Participating institutions are: Cornell University, Georgia Institute of Technology, University of Illinois, Louisiana State University, Lowell Technological Institute, McGill University, North Carolina State College, University of Oklahoma, Princeton University, The Rice Institute, University of Texas, University of Maryland and Yale University.

Herman Cone Memorial Scholarships

The establishment of The Herman Cone Memorial Scholarships, to be awarded to three outstanding students in the School of Textiles at North Carolina State College, was announced recently by Mrs Herman Cone of Greensboro, NC, president of The Herman Cone Family Foundation, Inc.

Mr Cone, who died in 1955, was a nationally-known textile executive and leader. He was an officer of the NC Textile Foundation for many years and was personally interested in the progress of NC State's Textile School.

Other members of The Herman Cone Family Foundation, Inc, are Mrs Cone's two sons, Herman Cone, Jr, and Alan Cone, both of Greensboro.

Consisting of three annual awards of $500 each, the scholarships will be given to a sophomore, a junior, and a senior in the School of Textiles at State College. All recipients must be North Carolina natives.

Winners will be chosen by the college's Textile Scholarship Committee on the basis of scholastic achievement, character, and need. Each recipient will continue as holder of his scholarship until graduation, if his performance is satisfactory.

Kylan Corp Producing Deacetylated Chitin Commercially

The Kylan Corp, Spartanburg, SC, on June 1st began producing commercial quantities of deacetylated chitin under the trade mark *Kylan*.

Kylan is described as a unique high polymeric substance, exhibiting properties and characteristics not found in any other high polymers. A recent patent licensed to Moretex Chemical Products Inc, Spartanburg, covers the utilization of Kylan for imparting shrink-resistance to wool and wool-containing fabrics. Applications of Kylan to several typical woolen and worsted fabrics on a commercial scale are said to have shown that, with a deposition of about 3% solids of Kylan on the fabric, shrinkage on washing is reduced from 40% to less than 5% during a series of as many as twelve wash cycles in a commercial laundering operation.

Chitin, the raw material from which deacetylated chitin is produced, is fairly widely distributed in nature and exists in various forms in the crustacea such as crabs, lobsters, shrimp and crayfish, in which it is the building block, forming the horny exoskeleton of the animal. It is also found in grasshoppers, various forms of fungi and hard-shell beetles. The product produced by the Kylan Corp is isolated from chitin obtained from shrimp shells readily available in the area adjacent to Brunswick, Georgia. After an extensive review of the work done by others, the Kylan Corp with Moretex Chemical Products, Inc, assisted by the Robinette Research Laboratories, Inc, Ardmore, Pa, have developed an improved process to produce a suitable industrial grade of deacetylated chitin. It is stated that, until recently, there was not a sufficient concentration of raw materials available at one place to economically produce chitin; however, the cooperative research and pilot plant work have led to the design and erection of the plant at Brunswick, Georgia.

Kylan is a polymer of glucose amine and may be described as amino cellulose. The structural formula for Kylan is very similar to that of cellulose. X-ray diagrams of a high degree of order show that the polymer is a fiber- and film-forming material.

Kylan is a cationic protective colloid and as such finds use as an emulsifying agent and a stabilizing agent for emulsions containing acids and cationic materials. Kylan in combination with oils and lubricants forms an antistatic treatment for fibers, filaments and yarns. It is reported possible to spin solutions of Kylan into continuous fibers having high strength and good dyeing properties.

Although Kylan will be produced first in one viscosity grade, it is anticipated that in the near future Kylan will be available in various grades. In addition, it is expected that chitin will be available for further industrial development and that other derivatives, such as sulfated chitin and carboxymethyl chitin, likewise will be made available.

Technical service and sales of Kylan will be in the hands of Moretex Chemical Products.

"Color Magic" Shown by National Aniline

A drab "Miss America of 1856" was transformed into a colorful modern beauty 15 times daily as a special attraction of Allied Chemical's recently concluded exhibit at the Investment Information Center sponsored by Merrill Lynch, Pierce, Fenner & Beane in the main concourse of Grand Central Station, New York.

Commemorating the centennial of Perkin's discovery of mauve, first synthetic dyestuff, the demonstration by Allied's National Aniline Division included several eye-catching feats of "color magic" based on modern textile-dyeing techniques. Contrasting costumes of 1856 and 1956 were modeled to dramatize the part color plays in our daily lives as a result of Perkin's discovery and its development by America's organic chemical industry.

Drying and Etching Trays of Plastic

The Haveg Corporation, Wilmington, Del, is offering a complete line of chemical-corrosion-resistant drying trays in a wide variety of sizes. It is said that these trays provide excellent corrosion resistance for service in the drying of dyes, acid reagents, and similar products. The crystals are said to separate easily from the surface and the low coefficient of heat transfer of the material itself facilitates uniform crystal formation. Trays reportedly can be used at temperatures up to 300° F without damage. Similar trays are also applicable to a wide range of etching problems. The development of trays in special sizes and shapes is economically practical, according to the manufacturer.

NBITT Convocation

The new million-dollar Engineering and Science Building of the New Bedford Institute of Textiles and Technology was dedicated at a convocation held on June 1, 1956 in the new auditorium-gymnasium adjoining the newest structure. A large number of visiting academic and educational leaders participated in the colorful processional opening the exercises.

Honorary degrees were conferred on Joseph Dawson, Jr, president-treasurer, Knowles Loom Reed Works, Inc; Philip Manchester, superintendent, King Philip A Division, Berkshire-Hathaway, Inc; George Walker, president emeritus, New Bedford Institute of Textiles & Technology; and Sumner G Whittier, lieutenant-governor, Commonwealth of Massachusetts.

Greetings were conveyed to the college administration by the Commissioner of Education, John A Desmond, Jr, for the Commonwealth, by Mayor Francis J Lawler for the City of New Bedford and by William H Poisson for the Alumni Association. Representing the board of trustees of the Institute, Chairman Joseph Dawson, Jr, formally presented the keys to the new building to John E Foster, NBITT president.

The dedication address was given by Lieutenant Governor Whittier, who outlined the history and development of Massachusetts and of the college. On the basis of this great past, he evaluated the present and projected into the probable future. In this future he saw an important place for the New Bedford Institute of Textiles and Technology.

General Calendar

AMERICAN ASSOCIATION FOR TEXTILE TECHNOLOGY, INC
Sept 5, Oct 3, Nov 7, Dec 5 (All meetings at the Vanderbilt Hotel, New York, N Y).

AMERICAN OIL CHEMISTS SOCIETY
Spring, 1957 (Spring meeting, New Orleans); Sept 30-Oct 2, 1957 (Fall meeting, Cincinnati); Apr 21-23, 1958 (Memphis); Oct 20-22, 1958 (Chicago); Spring, 1959 (New Orleans); Fall, 1959 (Los Angeles).

AMERICAN SOCIETY FOR TESTING MATERIALS
Sept 16-22—2nd Pacific Area National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles, Calif; Oct 16-19—Fall Meeting of Committee D-13 on Textiles, Warwick Hotel, New York, N Y.

THE FIBER SOCIETY
Fall Meeting—Sept 6-7, Warwick Hotel, New York, N Y, Spring Meeting — May 1-2, 1957, The Clemson House, Clemson, S C

THE INSTRUMENT SOCIETY OF AMERICA
11th Annual Instrumentation-Automation Conference and Exhibit—Sept 17-21, New York Coliseum, New York, N Y

LOWELL TECHNOLOGICAL INSTITUTE
Sept 26-28 (Perkin Centennial observance and open house).

NATIONAL COTTON COUNCIL OF AMERICA
October 3-4 (Chemical Finishing Conference, Hotel Statler, Washington, DC); Feb 28-Mar 1 (Cotton Research Clinic, General Oglethorpe Hotel, Savannah, Ga).

PERKIN CENTENNIAL
September 10-15, Waldorf-Astoria Hotel, New York, N Y.

THE QUARTERMASTER ASSOCIATION
Annual Convention—Oct 27-28, Conrad Hilton, Hotel, Chicago, Ill.

SOUTHERN TEXTILE EXPOSITION
19th Exposition, Oct 1-5, Textile Hall, Greenville, S C.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Sept 11, Oct 9, Nov 7 (Palm Terrace Suite, Hotel Roosevelt, New York, N Y).

Addendum

Re: "A Rapid Spot Test for the Identification of Aminoplasts on Textiles"

In the article, "A Rapid Spot Test for the Identification of Aminoplasts on Textiles," which appeared in the June 18th issue of ADR, three paragraphs were omitted under the "Miscellaneous" Section. The complete section follows:

MISCELLANEOUS——In order to insure proper interpretation of the identification test, it is necessary to run familiarization trials with cloths treated with known resins. It is also advisable to retain samples of cloths treated with known resins as a means of confirming identification of an unknown resin. The identification stains on cloths cannot be retained as standards because of degradation of the spotted areas due to the action of concentrated sulfuric acid. It may be possible to prepare color reference standards by means of dyestuffs, but this approach has not been investigated.

The use of various additives in resin treatments may have an effect on the color reaction of the identification test. The use of resins other than those investigated, alone or in combination with those investigated, might also complicate the color reaction. These and other similar considerations require additional evaluations.

Cloth which has been tested by this identification stain will disintegrate if allowed to stand for several hours. However, if after the identification is complete the stained fabric is immediately rinsed in water and neutralized with dilute sodium bicarbonate solution, the fabric will not be damaged. A slight stain usually persists on the fabric. The intensity of the stain will be proportional to the degree of coloration formed during the identification test.

While this test is not the ideal "one solution instantaneous color spot test," it approaches this goal. It is a positive identification test for melamine and a number of urea resins and certain combinations thereof.

• NAMES IN THE NEWS •

Dorn

Ertel

Rathgeb

Davis

Prutton

Loeffler

In line with the J C Penney Company Retirement Plan, **Charles W Dorn** retired as director of the Research Laboratory on July 1st after 27 years with the Company. He is succeeded to the post by **P J Fynn,** formerly assistant director, who has been with the Penney Co for seven years.

Mr Dorn has gone into consulting work as a textile consultant with offices in Suite 1300, 369 Lexington Ave, New York 17, NY. A graduate of the University of Louisville, he served in World War I, after which he became an instructor in chemistry at Pennsylvania State College. He became chief chemist for Melba Manufacturing Co, Chicago, in 1921. Prior to joining the Penney Co in 1929, he served for three years as chief chemist for Norieda Perfumery in New York.

Mr Dorn's activities in various professional organizations are extensive.

An active member of AATCC, he is currently serving as chairman of the Executive Committee on Research and a member of the Joint Committee of AATCC and the American Society for Testing Materials, which determines policies of research for the two organizations. He also represents AATCC and the National Retail Dry Goods Association on various committees of the American Standards Association. Chairman of NRDGA's Technical Committee, Mr Dorn is a recipient of that Association's Silver Plaque for distinguished service to retailing in the field of textile research.

Mr Dorn is a member of Textile Research Institute; a member of ASA's Standards Council and vice chairman of its Consumer Goods Committee; a member of the Steering Committee of International Organization for Standardization, Division of Textiles; and a past collaborator, Cotton Chemical Finishing Division of the Southern Regional Research Laboratory, U S Dept of Agriculture. He is chairman of the standing committees for the U S Dept of Commerce's Commercial Standards 59-44—Textiles, Testing and Reporting, and 191-53-Flammability of Clothing Textiles, and chairman of the Industry Advisory Committees to the Federal Trade Commission on Water Repellent Fabrics and Rainwear and Shrinkage of Wool Products.

Mr Dorn within recent years has participated in two open-shot Atom Bomb tests studying textiles, namely Operation Doorstep in 1953, and Operation Cue in 1955.

The Cincinnati Division of the Toms River-Cincinnati Chemical Co has named **John Ertel** assistant manager and **Frederich Rathgeb** manager of research and development. Both appointments became effective June 13th.

Mr Ertel has served as manager of the Research and Development Department since 1954. Dr Rathgeb joined TRC in 1950.

The Chemstrand Corp has announced the appointments of **S Jack Davis** as assistant director of research in charge of the Textile Processing Division and **Edward V Burnthall** as senior section leader.

Mr Davis has been in charge of coordinating activities in textile research since he joined Chemstrand in March, 1952. He is a Councilor of AATCC.

Mr Burnthall is in charge of the Dyeing and Finishing Division of Chemstrand's Research and Development Department.

CORRECTION

Your attention is called to an erroneous caption which appeared on page 396 of the June 4th issue of ADR.

The middle photo, captioned "Feeley," is that of C F Martin, Jr, who was recently named Southern sales manager for E J Feeley Co, Boston, Mass.

Food Machinery and Chemical Corporation has announced that, at the annual organization meeting of its board of directors, President **Paul L Davies** was elected chairman and chief executive officer, and **Ernest Hart,** formerly executive vice president in charge of chemical divisions, was elected president. **John D Crummey,** who has served as chairman of the board of directors since his retirement from active management in 1946, was elected honorary chairman.

At the same meeting the following executive promotions were made: **Carl F Prutton,** vice president and technical director of chemical divisions, was elected executive vice president in charge of chemical divisions; **James M Hait,** vice president, director of engineering, and manager of the Ordnance Division, was elected executive vice president; **John D Fennebresque,** formerly vice president and assistant to the president, was was elected executive vice president; **Jack M Pope,** administrative vice president, was elected financial vice president; and **Alfred T Loeffler,** staff executive of the chemical divisions, was elected a vice president.

Ben C Carter, executive vice president in charge of machinery divisions, and all other corporation officers were re-elected with the exception of **Max E Bretschger,** who retired on May 1.

The Board of Directors of The National Federation of Textiles, Inc has designated **Edmund Wellington, Jr** as secretary of the Federation—the fifth to bear that title since its inception in 1872. **Irene Blunt** will continue as executive director and treasurer, with Mr Wellington as general assistant and in charge of special group activities.

Mr Wellington has been with the Federation since February 1955 and came to NFT from the State Department where he had been serving in Hanoi, Viet Nam, as vice-consul.

McDonald

Ahrens

Thomas J McDonald, for the past three years a technical salesman in New Jersey and New York for Verona Dyestuffs, has been named New England sales representative for Emkay Chemical Co, Elizabeth, NJ.

Mr McDonald has been with United Merchants and Manufacturers in Fall River, Mass and Bath SC, as a chemist and dyer; with American Thread Co, Willamantic, Conn, as supervisor of dyeing; and Newark Textile Dyeing Co as plant superintendent.

Bert W Ahrens has been appointed technical sales representative of the Technical Products Division, E F Drew & Co, Inc.

He was associated with Apex Chemical Co, Newark, N J, for thirteen years in a technical sales capacity.

Arnold, Hoffman & Co, Inc has announced the appointment of **Donald J Eccleston** as sales manager for the company's Northern Branch. He will make his headquarters at the Teterboro, NJ, Sales Office. Mr Eccleston assumes the position recently vacated by **Leonard G Tubbs** when the latter became general sales manager for the company.

Prior to this appointment, Mr Eccleston was New England Manager for the Textile Division of Hilton-Davis Chemical Company and previously held managerial positions with Warwick Chemical Company and Glasgo Finishing Company.

OBITUARY

DAVID C FORSHT

David C Forsht, president of Belle Chemical Company, Reading, Pa, died June 11 of a heart attack. Mr Forsht joined Belle Chemical in 1947, one year after the firm's founding. He formerly served as secretary-treasurer and vice-president of the firm, and as president from January 1955 to his death.

Mr Forsht was a native of Lock Haven, Pa, where he attended Lock Haven State Teachers' College. He was active in many civic affais in Reading in recent years and a member of the Masonic order.

He is survived by his widow, Helen G (Oldknow) Forsht; a daughter, Eleanor A; a step-daughter, Patricia Brossman; a son, James L, USAF, stationed at Ethan Allen Base, Vt; a sister, Martha, wife of Thomas C Snyder, Mill Hall; and a brother, Frank, of Los Angeles.

Wiliam Carroll, formerly vice president and sales manager, has been named to succeed the late **David C Forscht** as president of Belle Chemical Co, Reading, Pa. Mr Carroll is moving to Reading with his family from the firm's branch office in Charlotte, NC.

Rudolph Meuser was recently named manager of Forstmann Woolen Co's finishing department, with responsibility for the entire finishing and piece dyeing operation.

Adolph Born, formerly in charge of the division, remains as a finishing consultant. He has been with Forstmann since 1932.

Mr Mueser joined the finishing department in 1946.

Green

Smith

William A Green has been appointed manager of Hilton-Davis Sales Co, Providence, RI, the New England distribution and technical service center for textile dyestuffs of The Hilton-Davis Chemical Company, Cincinnati. He succeeds **Donald J Eccleston.**

Mr Green has been sales manager of Hilton-Davis Sales Co since its inception in 1952.

Ray E Smith has been appointed technical representative of Mona Industries, Inc, Paterson, NJ. He will handle demonstration work and technical service.

Mr Smith's previous associations were with Aquex Development and Sales Corp, Onyx Oil & Chemical Co, and the Textile Research Dept of American Viscose Corp.

Jack H Firpo, executive vice-president of Francolor Inc, Woonsocket, RI, left for Europe on June 17, to report to CFMC's headquarters on the activities of Francolor Inc since his taking over its management on February 15, 1956.

Mrs France A Decelles is serving as acting manager during the absence of Mr Firpo.

The Hart Products Corporation has announced that **Abraham S Endler,** a research chemist in its Jersey City laboratories, has been awarded his Ph D in Organic Chemistry by the Polytechnic Institute of Brooklyn.

Eriteadlane

— ESTONIAN FOR

SPECIALIZATION

IN ANY LANGUAGE,

PEERLESS MEANS **SPECIALIZATION**

PEERLESS COLOR COMPANY, INC.

521-535 North Avenue, Plainfield, New Jersey

Manufacturers of Dye Colors since 1916.

Export Representative: Herbert Lorenz, Inc., World Traders
299 Madison Avenue, New York 17, N. Y.
Cables: HACOLORENZ

ap-
Davis
New
nical
fs of
pany,
ld J

ager
s in-

nted
In-
will
ech-

tions
and
Co,
t of

resi-
cket,
re-
the
his
Feb-

ving
ence

has
dler,
City
his
the
n.

1956